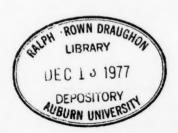
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SESOURCESABSTRACTS





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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 10, NUMBER 23 DECEMBER 1, 1977

W77-11501 -- W77-12250

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

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03	WATER SUPPLY AUGMENTATION AND CONSERVATION Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.
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06	WATER RESOURCES PLANNING Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.
07	RESOURCES DATA Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.
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AC	CESSION NUMBER INDEX

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A STOCHASTIC MODEL FOR THE SIMULA-TION OF DAILY FLOWS, Karlsruhe Univ. (West Germany). Institut fuer

Wasserbau III.

For primary bibliographic entry see Field 2E. W77-11603

THE MONTE CARLO APPROACH TO OP-TIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS, Technical Univ. of Warsaw (Poland). Inst. of En-

vironmental Engineering.
For primary bibliographic entry see Field 4A. W77-11604

CONNECTIONS BETWEEN CLIMATE AND

DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environmental

For primary bibliographic entry see Field 2B. W77-11629

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN

CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands).
Dept. of Physics and Meteorology.
For primary bibliographic entry see Field 3F. W77-11631

OPTIMAL PREDICTION OF PONDING,
Agricultural Research Service, Fort Collins, Colorado.

For primary bibliographic entry see Field 2G. W77-11798

INTEGRATED HYDROLOGICAL

CATCHMENT MODEL EGMO, Institut fuer Wasserwirtschaft, Berlin (East Ger-A. Becker

Hydrological Sciences Bulletin, Vol 22, No 1, p 145-151, March 1977. 3 fig, 4 ref.

Descriptors: *Hydrologic data, *Model studies, *Watersheds(Basins), Flow, Structure, Programs, Storms, Mountains, Overland flow, Storm runoff, Base flow, Foreign countries, Foreign research. Identifiers: *Catchment models, *Flow components, Hypodermic flow, Impervious areas.

It has proven reasonable to consider 3 runoff components for the complex modelling of runoff in basins, especially in the mountainous areas of the German Democratic Republic. The 3 components are: a quick response component, considered as overland flow occurring only during intense storm rainfall or snowmelt; a delayed response direct runoff component; and a gradually varying com-ponent, considered as baseflow mainly fed by the groundwater systems of the basin and representing the stable component of river flow during dry periods. The consideration of the 3 components required three corresponding runoff levels: the surface overland and channel flow system; the soil horizons of higher hydraulic conductivity; and the groundwater system aquifers. A short description was given of the structure of the integrated catchment model EGMO, the flow components considered, the basic principles of the sub-models, and the procedure of the main program. (Roberts-ISWS) W77-11815

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF

New Mexico Inst. of Mining and Technology, Socorro. For primary bibliographic entry see Field 2E.

W77-11985

EFFECT OF RAINFALL-EXCESS DETERMINA-TION ON RUNOFF COMPUTATION, New Mexico Inst. of Mining and Technology.

For primary bibliographic entry see Field 2B. W77-11986

DIGITAL SIMULATION OF A DRAINAGE

Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources.

V. C. Kulandaiswamy, and T. B. Rao.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 443-454, 1974. 6 fig. 1 tab. 18 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Mathematical models, *Storm runoff, Hydrology, Hydrographs, Runoff, Surface runoff, Computer models, Hydrologic systems, Equa-tions, Analytical techniques, Precipitation(Atmospheric), Base flow, Hydrograph analysis, Hydrologic aspects, Rainfall. Identifiers: *Beech River(Tenn).

The drainage basin was treated as a hydrological system that converts rainfall into abstractions and surface runoff. The basin system was represented by a nonlinear mathematical model and was simulated on a digital computer. The model makes use of the methods developed in earlier studies for predicting abstractions and the system parameters. Given precipitation data, antecedent conditions, and certain basin parameters for baseflow and surface runoff, the mathematical model helps to predict the resulting runoff from the basin. The model was applied to a number of basins. The details of the basins and the number of storms analyzed in each basin were given, and the results obtained for Beech River, Tennessee, were presented. The proposed model reproduced the observed runoff hydrographs fairly satisfactorily and lends itself to application for flood studies from actual basins. e also W77-06708) (Humphreys-ISWS) W77-12082

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING,
Abademic Vied,

Slovenska Akademie Bratislava (Czechoslovakia). For primary bibliographic entry see Field 4A. W77-12083

DESIGNING CONCEPTUAL CATCHMENT MODELS FOR AUTOMATIC FITTING METHODS,

Ministry of Works, Wellington (New Zealand).

R. P. Ibbitt, and T. O'Donnell. In: Mathematical Models in Hydrology, Volume 2;

Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 461-475, 1974. 10

Descriptors: *Watersheds(Basins), *Model stu-*Mathematical models, Precipitation(Atmospheric), Storage, Surface waters, Groundwater, Groundwater storage, Soil Groundwater, Groundwater storage, Soil moisture, Runoff, Infiltration, Discharge(Water), Evaporation, Evaporation, Hydrology. Identifiers: Watershed models, Fitting methods. Problems arise when optimum parameter values for a catchment model are sought with the aid of automatic optimization techniques. Some of the problems are inherent to the techniques themselves, others to the particular nature of catchment models. The several problems were examined, their causes were explained, and, where possible, recommendations for their solution (or avoidance) were made. (See also W77-06708) (Sims-ISWS)

A SWAMPLAND MODEL, Ministerio do Interior, Rio de Janeiro (Brazil). De-partmento Nacional de Obras de Sancamento. For primary bibliographic entry see Field 2E. W77-12085

DETERMINATION OF INSTANTANEOUS UNIT HYDROGRAPHS BY LEAST SOUARES POLYNOMIALS,

Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-12086

PROBLEMS OF APPLYING THE CONCEP-TUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY,

Research Inst. for Water Resources Development, Budapest (Hungary). G. Kienitz.

D. Kielitz.

In: Mathematical Models in Hydrology, Volume 2;
Proceedings of the Warsaw Symposium, July
1971: International Association of Hydrological Sciences Publication No. 101, p 504-510, 1974. 2

*Watersheds(Basins), Descriptors: *Model studies, Precipitation(Atmospheric), Rainfall, Precipitation excess, Water balance, Mathematical models, Computer models, Storage, Simulation analysis, Depression storage, Hydrology. Identifiers: *Hungary.

A conceptual model was described for simulating runoff phenomena in flat catchments where processes are governed totally by man-made structures. The model was tried with cases observed in experimental watersheds, and the model was found to describe well the character of the processes. In order to render the model available for practical use in planning and forecasting, methods were sought to determine in given cases the involved parameters described by certain physical characteristics. Physical hydrological experimentations therefore were carried out con-cerning the parameters. Greatest progress was made in connection with determining the amounts of excess precipitation which concentrate in depressions and thus provide the supply of water feeding the canal system. The purpose of the paper was to demonstrate the lines of present investiga-tions and their results so far. (See also W77-06708) (Sims-ISWS) W77-12087

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS, Indian Inst. of Tech., New Delhi. Dept. of Civil

Engineering.

S. Chander.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 527-539, 1974. 15 fig, 1 tab, 8 ref.

Descriptors: *Watersheds(Basins), *Runoff, *Model studies, Mathematical models, Storage, Inflow, Foreign countries, Discharge(Water), Foreign research, Networks, Reservoirs, Computer models, Hydrographs, Simulation analysis, Precipitation(Atmosphene), Rainfall, Hydrology.

Group 2A-General

Identifiers: *Harlow(England).

A reservoir attenuates and delays the peak of an inlet hydrograph - a property similar to that of a catchment, the difference being that the attenuation and delay are larger in magnitude for a catchment than those for a corresponding reservoir, given the same recession curve. In this paper, a network of reservoirs was evolved which exhibited the properties of a catchment in that the peak was attenuated and was delayed in time, and the recession side of the hydrograph was repeated for different inputs. A mathematical model based on the above physical concept was derived for the Cannon Brook catchment at Harlow (England). The parameters of the model were computed from a random input-output even on the catchment and then they were used for calculating the outputs for other events. It was shown in conclusion that the observed hydrographs can be predicted by the model with a remarkable accuracy. (See also W77-06708) (Sims-ISWS) W77-12088

A MULTIPLE INPUT SYSTEM MODEL FOR THE HYDROLOGICAL BASIN,

Indian Inst. of Tech., Kanpur. Dept. of Civil En-

gineering. S. Ramaseshan, and R. S. Anant.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 540-547, 1974. 4 fig, 3 tab, 11 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Surface runoff, *Mathematical models, Hydrologic aspects, Hydrographs, Computer models, Hydrology, Precipitation(Atmospheric), Floods, Data processes, Analytical techniques, Hydrologic systems.

The effective rainfall-direct surface runoff process was represented by a multiple input system model. Such a model can use the available spatially sampled data of precipitation with fewer approximations and no interpolation in comparison to lumped and distributed parameter models. The components are non-interacting and are represented by Nash models. The parameters of the system were estimated by the principle of least squares using the steepest gradient technique. A linear model with parameters esti-mated as the geometric mean of calculated values seems to be a satisfactory representation of the system. The model also facilitates a parametric approach to station weights. The suggested model can be improved by considering interacting components. ISWS) (See also W77-06708) (Humphreys-W77-12089

RAINFALL-DISCHARGE TRANSFORMATION RAINFALL-DISCHARGE TRANSFORMATION
MODELS MAY BE DIVIDED INTO TWO
CATAGORIES (LES MODELES DETERMINISTES DE TRANSFORMATION DES
PRECIPITATIONS EN DEBIT),
Societe Grenobloise d'Etude et d'Applications

Hydrauliques (France).

J. M. Dujardin, and P. Jouhet.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 558-569, 1974. 4 fig.

Descriptors: *Watershed(Basins), *Model studies, *Floods, *Mathematical models, Surface runoff, Flood forecasting, Base flow, Infiltration, Evaporation, Hydrological aspects, Hydrology, Rainfall-runoff relationships, Water balance, Storage, Precipitation(Atmospheric), Rainfall, Equations, Analytical techniques, Hydrographs.

Rainfall-discharge transformation models may be divided into two categories. Overland runoff models, in which attention is given only to the runoff phase of meteorology water, so that a rational storm/flood equation may be extracted. Both infiltration and evaporation are considered as losses, and the losses are allowed for in aggregate by application of a subtractive parameter or a runoff coefficient The Previk model, belonging to the overland runoff category, includes a production function (calculation of net supply rainfall) and a modulation function (calculation of discharge). The overland runoff type of model is adequate flood study and forecasting. When hydraulic balance models are used, an attempt is made to reproduce the real physical balance of hydraulic exchanges and the underground paths followed by water. A water balance is compiled in an orthodox manner by outlining the transfer of water from one level to another in the matrix. The Bilik model, which falls within the hydraulic balance category, may be operated using data which are generally accepible and which include a reasonable number of parameters, facilitating its adjustment. The model is suitable for reproducing river behavior throughout the hydrological cycle and for studying seasonal variations and water resource problems. (See also W77-06708) (Humphreys-ISWS) W77-12090

THE MODEL OF THE WATER BALANCE AND NUTRIENT UPTAKE AS A BASIS FOR HYDROLOGICAL, AGRO-HYDROLOGICAL AND OTHER PROJECTS, Institute for Land and Water Management Research, Wageningen (Netherlands).

W. C. Visser.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 580-597, 1974. 9 fig. 15 ref.

Descriptors: *Mathematical models, *Water balance, *Plant growth, *Model studies, Discharge(Water), Streamflow, Evaporation, Rainfall, Infiltration, Growth stages, Growth rates, Nutrient requirements, Soil moisture, Withdrawal, Groundwater, Analytical techniques, Hydrology, Equations. Identifiers: Agro-hydrological models.

Hydrological science can be summarized in hydrological and agro-hydrological models. The hydrological model can be based best on the water balance, which is a consequence of the law of conbalance, which is a consequence of the law of con-servation of matter. The agro-hydrological model is based on the diffusion equation, which leads to the law of limiting factors. The importance of the models is that the underlying principles are accepted generally. Further, a wide range of processes can be described by the two physical relations. The model can be used to check new scientific results for processes participating in the water balance or in plant growth. The model also can result in indications for practical design, and it may result in a description of capillarity or evaporation. But also, the model may result in an indication to carry out sprinkling irrigation. The models both for the water balance and for plant growth were discussed, and the state of affairs with respect to the least developed part of the adjustment technique was explained. (See also W77-06708) (Humphreys-ISWS) W77-12091

CONVECTIVE STORM FIELD SIMULATION FOR DISTRIBUTED CATCHMENT MODELS, California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 2B.
W77-12092

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL Institut fuer Wasserwirtschaft, Berlin (East Ger-For primary bibliographic entry see Field 2F.

W77-12093

BEHAVIOUR AND PHYSICAL STABILITY OF SHEETFLOW IN SURFACE RUNOFF MODELS, Prague Agricultural Univ. (Czechoslavakia). Dept. of Water Resources. For primary bibliographic entry see Field 2E. W77-12094

A MATHEMATICAL MODEL FOR FLOOD WAVE SIMULATION USING SYNTHETIC RAINFALL DATA FOR A VAST WATERSHED, Institute for Water Resources, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2E. W77-12095

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-

PART 1, Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering. B. S. Mathur.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 634-642, 1974, 4

Descriptors: *Watersheds(Basins), *Channels, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Runoff, Discharge(Water), Floods, Flood peak, Surface runoff, Surface drainage, Hydrology. Identifiers: Linear channels.

In this paper, a natural catchment was represented conceptually by a set of linear channels arranged in series. The translational action of the catchment was discussed in the light of the inherent properties of linear channels. But storage effects were explained through a distributive input scheme for various sub-watersheds which are functionally re-lated to linear channels. An analytical approach was discussed for getting the sub-watersheds through a time invariant catchment distribution. In Part 2 of the paper, the author successfully applied the conceptual model theory to a catchment for analyzing uneven spatial distribu-tion of rainfall and resulting runoff. (See also W77-12097 and W77-06708) (Sims-ISWS) W77-12096

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-

Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 643-656, 1974. 9 fig. 2 tab, 4 ref.

Descriptors: *Watersheds(Basins), *Channels, *Hydrographs, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Runoff, Surface runoff, Unit hydrographs, Floods, Surface drainage, Hydrologic data, Hydrology. Identifiers: Linear channels.

Various procedural steps involved in the application of a conceptual series model of linear channels to a natural test catchment were discussed in detail. The steps include: distribution of catchment area into arranged groups of sub-watershed areas termed as 'mean delay-time areas', representation of the 'areas' through a series arrangement of linear channels, analysis of rainfall for obtaining time distribution of weighted effective precipita-tion, and lastly, evolution of a genetic runoff scheme utilizing the physiographical and meteorological details. The computed runoff

hydrographs were compared with the measured hydrograph at the gage and computed from tradi-tional unit graph approaches to prove the effec-tiveness of the suggested technique in dealing with unevenness of spatially distributed rainfall. (See also W77-12096 and W06708) (Sims-ISWS)

A NEW METHOD OF COMPUTATION OF THE SUSPENDED SEDIMENT LOAD, Freiburg Univ. (West Germany). Geographisches

For primary bibliographic entry see Field 2J.

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM, Gatehouse Farm, Essex (England).

For primary bibliographic entry see Field 2E. W77-12099

PHYSICO-STATISTICAL MODEL OF RAIN-FALL FLOOD FORMATION AND DETER-MINATION OF ITS PARAMETERS, Hydrometeorological Service of the USSR,

Moscow. V. I. Koren, and L. S. Kuchment.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 688-693, 1974. 1

Descriptors: *Small watersheds, *Model studies, **Runoff, **Hydrograph analysis, Watersheds(Basins), Statistical models, Mathe-matical models, Theoretical analysis, Hydrographs, Surface runoff, Hydrology, Meteorology, Hydrologic aspects, Analytical techniques, Foreign research, Foreign countries, Equations, Water yield, Evaporation, Infiltration.

Transfer from the rainfall model on an elementary plot to the model describing the rainfall runoff formation in the catchment was achieved by theoretical probability averaging. An optimization method was applied to determine the model parameters. The model was tested on the observed data of a few small catchments. (See also W77-06708) (Humphreys-ISWS) W77-12100

MATHEMATICAL MODEL OF SPRING RU-NOFF FORMATION, Hydrometeorological Service of the USSR,

A. P. Zhidikov, A. G. Levin, N. S. Nechaeva, and

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In: Mathematical Models in Hydrology, Volume 2; In: Mannematical Models in Flydrology, Voltaire 2, Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 694-700, 1974. 5

Descriptors: *Mathematical models, *Snowmelt, *Runoff, *Watersheds(Basins), Model studies, Mathematical studies, Equations, Analytical techniques, Water sources, Hydrograph analysis, Foreign research, Foreign countries, Hydrology, Meteorology, Water balance, Snowpacks, Water storage, Water yield. Identifiers: *USSR.

Electronic computing techniques and use of appropriate mathematical models made it possible to improve methods of flow forecasting by snowmelt improve methods of flow forecasting by snowmelt calculation. The general principles and assumptions of the models are: (1) The river basin is regarded as a certain dynamic system with lumped parameters which is affected by the inflow of melt water and the response of which is the hydrograph in the river outlet. (2) The nonuniformity in space of the distribution of water storage in the snow pack, of snowmelt intensity and water yield from snow, of absorption of water by soil, of the capacity of closed concaves, of snowmelt runoff temporary control and of the rate of snowmelt down slopes and in the river network may be treated by statistical methods (e.g. distribution curves). (3) Snowmelt intensity, water yield from the snow pack, absorption of melt water and its accumulation on the basin surface, and inflow of water to the primary hydrograph network are considered as functions of time. (4) Equations for determining the components of the water balance and for describing the major processes of hydrograph for-mation have been obtained from theoretical premises and general concepts resulting from an analysis of empirical data and schematization of certain processes. The parameters of the equations are calculated or selected by taking into account the water catchment features. (5) The water balance components are calculated separately for open and forested parts of the basin. (6) The stan-dard observations of snow cover, air temperature, precipitation, cloudiness and wind have been used as the original data for hydrograph calculation. (7) as the original data for nydrograph calculation. (7) Precipitation falling during the snowmelt period is considered to be liquid. The model was evaluated by considering the degree of coincidence of calcu-lated and actual flood hydrographs. (See also W77-06708) (Humphreys-ISWS) W77-12101

MATHEMATICAL MODEL OF HYDROMETEOROLOGICAL REGIME FOR-MATION OF A RIVER BASIN, Gosudarstvennyi Gidrologicheskii Institut,

Moscow (USSR).

V. G. Andreyanov, and V. I. Babkin. In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 736-742, 1974. 1 fig. 8 ref.

Descriptors: "Small watersheds, "Mathematical models, "Meteorology, "Runoff, Watersheds(Basins), River basins, Model studies, Snow, Water balance, Precipitation(Atmospheric), Forecasting, Evaporation, Soil moisture, Lakes, Water storage, Base flow, Surface runoff, Foreign research, Foreign countries, Analytical techniques, Heat balance.

The report dealt with a proposed mathematical model of the formation of the hydrometeorological regime of a river basin. The model consists of a system of equations of water and heat balances and interrelations between the elements of the and interretations between the elements of the balances and between the determining factors. The model was compiled relative to the conditions of a small watershed of the Valdai Hydrological Laboratory, located in a very wet zone. The application of the model contributes to the precision of the model contributes to the mod the balances computation, and, at the given precipitation and radiation balance, it allows the forecast of the remaining elements of water and heat balances to be made. The construction of a of other physiographic areas, as well as the trans-position of the developed methods over river basins with mathematical model was outlined for river basins basins with a reduced amount of hydrometeorological observations. (See also W77-06708) (Humphreys-ISWS) W77-12102

MATHEMATICAL MODELLING OF THE FOR-MATION OF RIVER RUNOFF IN MOUNTAIN DRAINAGE BASINS,

Nauchno-Issledovatelskii Sredneaziatskii Gidrometeorologicheskii Institut. (IISSR)

L. N. Borovikova, and Yu. M. Denisov.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 743-750, 1974. 5

Descriptors: *Watersheds(Basins), *Hydrograph analysis, *Mathematical models, *Runoff, Model studies, Meltwater, Snow, Meteorology, Precipitation(Atmospheric), Rain water, Rainfall, Surface runoff, River basins, Mountains, Analytical techniques, Mathematical studies, Foreign research, Foreign countries, Hydrographs, research, Foreign Hydrologic aspects. Identifiers: *USSR.

Reported in the paper were the input of thaw and rain water to a mountainous watershed surface and its transformation into the discharge hydro graph at the outlet gage. The mountain drainage basin represents a complicated dynamic system, which transforms water falling on to its surface into the discharge hydrograph at the gaging sec-tion. The process can be described as the functioning of two large blocks. The first block transforms the initial data on air temperature, humidity of air, precipitation, etc., into the quantity of water which gets on to the surface of the catchment in a unit of time. The second block transforms incoming water into the runoff hydrograph. (See also W77-06708) (Humphreys-ISWS)

DETERMINISTIC AND STOCHASTIC MODELLING OF FLOODS IN MOUNTAIN RE-

Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata

(USSR). U. B. Vinogradov.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, 1971: International Association of Hydrol Sciences Publication No. 101, p 751-757, 1974. 1

Descriptors: *Model studies, *Floods, *Hydrographs, *Watersheds(Basins), Rainfall, Stochastic processes, Mathematical models, Hydrograph analysis, River basins, Mountains, Surface runoff, Hydrologic aspects, Analytical techniques, Foreign research, Foreign countries. Identifiers: *USSR.

A mathematical model for the deterministic and stochastic calculation of rainfall floods was described in the report. A mountain drainage area is a mixed collection of runoff elements; in the is a mixed collection of runoff elements; in the general case, each area forms quick surface runoff and ground runoff. The runoff hydrograph at the outlet can be obtained by adding all the inflow elementary hydrographs and smoothing them by moving averages. If necessary, the irregularity of runoff formation properties of the watershed surface can be taken into account along the river system. The ultimate purpose of stochastic modelling of rainfall runoff processes is the construction of frequency distribution curves of flood characteristics. The usual scheme of calculation is characteristics. The usual scheme of carculation sas follows: The sequence of mu-values for the rainless period of time are generated and then converted into initial loss depths. Next, rainfall quantities at different points of the watershed are generated. Normalized and standardized rainfall duration is considered to be constant over the en-tire basin. The repetition of the modelling of all necessary variable values constitutes a nu necessary variable values constitutes a numerical experiment for the determination of distribution curves for any flood characteristics (the Monte Carlo principle). In examples of some Middle Asian catchments, acceptable results were obtained for hydrographs, for runoff depth, for maximum discharges for some floods, and for the construction of distribution curves of flood characteristics. (See also W77-06708) (Humphreys-ISWS) ISWS) W77-12104

LINEAR INVARIABLE WA
RESPONSE MODELS,
Ministry of Agriculture WATERSHED Ministry of Agriculture, Jerusalem (Israel). Hydrological Service.

Group 2A-General

A. Ben-Zvi.
In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 758-761, 1974. 9

Descriptors: *Watersheds(Basins), *Unit hydrographs, Mathematical models, "Hydrograph anal-ysis, Analytical techniques, Model studies, Hydrologic aspects, Time of concentration, Velocity, Runoff, Theoretical analysis. Identifiers: Time-area concentration curve

Based upon the assumption that the velocity vector at every point of a watershed depends only on the location of the point, an invariable time-area concentration curve can be derived for the watershed. The curve was shown as being identical to an invariable instantaneous unit hydrograph. The existence of either function necessitates the existence of the other one. The generally accepted assumptions behind the unit hydrograph can be derived from the foregoing assumption. The response of a watershed, for which this assumption would not work may be approximated l means of a family of unit hydrographs of which every number would be valid for a limited range of discharges. (See also W77-06708) (Humphreys-ISWS) W77-12105

APPLIED PRINCIPLES OF CATCHMENT

SIMULATION, Institut fuer Wasserwirtschaft, Berlin (East Germany).

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 762-774, 1974. 6 fig, 1 tab, 15 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Hydrologic systems, *Simulation analysis, Floods, Low flow, Groundwater, Mathematical models, Time lag, Hydrologic aspects, Hydrology, Mountains, Discharge(Water), River flow, Water storage, Runoff, Baseflow, Streamflow, Foreign research, Foreign countries. Identifiers: *East Germany, Isochrones

In a research program sponsored by the Office for Water Management of the Government of the GDR, catchment models are to be developed to improve the fundamentals of water resources systems planning and operation. The main objective of the models is the calculation of discharge series for selected river cross sections with an acseries for selected river cross sections with an ac-curacy as high as possible during both flood and low flow periods. The paper was concerned with the principles and model concepts, especially dis-tribution principles and an area variant concept of saturated area overland flow, being applied in the model of a mountainous catchment with an area of 15.7 sq km. The integrated model represents a nonlinear, area-variant system, representing the behavior of natural catchments. However, the sub-system models are rather simple for they are based mostly on linear relations (e.g. storage-discharge, capillary water recharge-deficiency, saturated area-gravity water storage, linear chan nel, linear storage distribution) in conjunction with several threshold concepts. Despite this, the in-tegrated system model offers extensive complexity, which seems to be sufficient to meet the important requirements of catchment simulation. (See also W77-06708) (Humphreys-ISWS) W77-12106

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS, Univ. Illinois Urbana-Champaign. Hydrosystems Section.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 775-783, 1974. 2

Descriptors: *Watersheds(Basins), *Hydraulic models, *Laboratory equipment, *Hydrograph analysis, Model studies, Mathematical models, Simulated rainfall, Runoff, Hydrographs, Hydrodynamics, Hydrologic aspects, Hydrology, Surface runoff, Overland flow, Computer models, Laboratory tests. Laboratory tests. Identifiers: Watershed experimental system.

This paper reported the function of a laboratory instrument called Watershed Experimentation System (WES) in the development of drodynamic watershed models. The WES is a scientific instrument of electronic, hydraulic, pneumatic, and structural design. It can produce a moving storm with variable temporal and spatial distributions of rainfall intensities over a laboratory watershed to produce runoff for computer recording and analysis of the hydrograph. Three mathematical models for watershed flow were developed on the basis of hydrodynamic dif-ferential equations. The paper described the WES and the hydrodynamic watershed models and discussed the use of the data obtained by WES to test the models. It was deconstrated that the WES plays an important role in the development of such models. Further studies are in progress in order to improve the models and modify them for practical applications. (See also W77-06708) (Humphreys-ISWS) W77-12107

SIMULATING OVERLAND FLOW ON HILL-SLOPES WITH A KINEMATIC CASCADE, Agricultural Research Service, Beltsville, Md.

Hydrography Lab.

In: Mathematical Models in Hydrology, Volume 2; In: Mathematical Models in Frydridgy, 1971: Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 784-793, 1974. 8

Descriptors: *Overland flow, *Slopes, *Rural areas, *Mathematical models, Surface runoff, areas, *Mathematical models, Surrace runou, Model studies, Watersheds(Basins), Analytical techniques, Analysis, Flow, Turbulent flow, Laminar flow, Mathematical studies, Hydrologic aspects, Hydrologic systems.

Identifiers: Kinematic wave equations.

Kinematic wave equations were used to generate overland flow on hillslopes. Straight line segments (planes) were used to approximate the curvature of hillslopes. Kinematic solutions for overland flow on the cascade of planes and on the actual curvature of the hillslopes were compared, and an error criterion was developed. It was found that by approximating the hillslope curvature by only three planes resulted in an error of about 10% in the kinematic solution, and the marginal error decreased rapidly with an increasing number of planes. (See also W77-06708) (Humphreys-ISWS) W77-12108

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION. University Coll., Dublin (Ireland). Dept. of Civil

Engineering.
For primary bibliographic entry see Field 5B.
W77-12109

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE OPERA-TION OF INFILTRATION WATER INTAKE, All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow

(USSR) For primary bibliographic entry see Field 2F. W77-12110

MATHEMATICAL MODEL OF THE RIVER-BED EROSION BELOW A DAM, For primary bibliographic entry see Field 2J. W77-12111

GROUNDWATER CHEMISTRY AND THE TRANSPORT EQUATIONS, Princeton Univ., N.J. Water Resources Program. For primary bibliographic entry see Field 2F. W77-12112

GENERALIZED STREAMFLOW SIMULA-TION SYSTEM, National Weather Service, Sacramento, Calif.

River Forecast Center. R. J. C. Burnash, and R. L. Ferral.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 838-847, 1974. 3

Descriptors: *Streamflow, *Watersheds(Basins), *Model studies, *Hydrologic systems, Computer models, Soil moisture, Surface runoff, Unsaturated flow, Percolation, Rainfall, Simulation analysis, Hydrologic aspects, Hydrologic properties, Evapotranspiration, Base flow, Hydrographs.

A rational streamflow simulation system was developed for digital computers using approxima-tions of soil moisture mechanics. The system was designed to provide a generalized mathematical solution of the hydrological characteristics observed in widely diverse watersheds. The model utilizes two levels of tension water and three levels of free water from which interflow and base flow are generated. Direct runoff is produced from rain are generated. Direct runoft is produced from rain on impervious areas. Surface runoff is produced by rainfall rates which exceed the capacity of the upper zone to store and transmit water. Upper zone tension water storage is depleted by evapotranspiration. Upper zone free water storage is depleted by evapotranspiration and also by lateral drainage and percolation, both of which vary with the moisture storages in upper and lower zones. Lower zone tension water storage is depleted by evapotranspiration. Lower zone free water storages generate base flow at rates which vary with the storages. The system can be applied economically in new areas by determining characteristics using relatively simple systematic analyses of available hydrometeorological data. The conceptual model has achieved a high degree of accuracy in streamflow simulation over a wide range of climates, vegetative covers and basin morphologies. It has demonstrated the ability to achieve a high degree of resolution when time de-pendent data were available and to model basin stream volumes effectively from broad scale input data. (See also W77-06708) (Humphreys-ISWS) W77-12113

A MATHEMATICAL MODEL FOR SIMULAT-ING THE TEMPERATURE STRUCTURE OF STRATIFIED RESERVOIRS AND ITS USE IN RESERVOIR OUTLET DESIGN, Water Resources Engineers, Inc., Walnut Creek,

Calif. For primary bibliographic entry see Field 5B. W77-12114

2B. Precipitation

EMPIRICAL PREDICTORS FOR NATURAL AND SEEDED RAINFALL IN THE FLORIDA AREA CUMULUS EXPERIMENT (FACE), 1970-

Virginia Univ., Charlottesville. Dept. of Environ-

For primary bibliographic entry see Field 3B. W77-11596

RAIN RESULTING FROM MELTING ICE PAR-

TICLES, Arizona Univ., Tucson. Inst. of Atmospheric Physics.

L. J. Battan. Journal of Applied Meteorology, Vol. 16, No. 6, p 595-604, June 1977. 13 fig, 16 ref.

Descriptors: *Rainfall, *Radar, *Raindrops. *Arizona, Particle size, Cloud physics, On-site investigations, Thunderstorm, Precipitavesugations, Friedmerstoff, Friedmann Friedman

By means of a zenith-pointing radar, observations were made of the reflectivities and Doppler spectra in orthogonal planes as a dissipating shower exhibiting a bright band passed overhead. The observations have been used to test various procedures for estimating hydrometeor parameters from mea-surements of radar reflectivitity. The procedures involve assumptions that the raindrop diameters were distributed exponentially, preferably in the manner prescribed by the Marshall-Palmer distribution. It was concluded that, in this case, such an assumption was not valid in regions where it was expected to be valid. As a consequence, estimates of median raindrop diameters and updraft velocities calculated from radar reflectivities were in error. The analyses indicated that raindrip size sorting under the influence of vertical wind shear can account for the observed non-exponential size distributions. (Sims-ISWS) W77-11597

THE SCALES OF HAIL,

Illinois State Water Survey, Urbana.

S. A. Changnon, Jr.

Journal of Applied Meteorology, Vol 16, No 6, p 626-648, June 1977. 16 fig, 1 tab, 144 ref. NSF ERP75 09980, AEN73 07770.

Descriptors: *Hail, *Great Plains, *North America, *United States, *Canada, *Reviews, Spatial distribution, Temporal distribution, Thunderstorms, Winds, Reviews, Damages, Crops, Weather, Agriculture, Precipitation(Atmospheric), Economics, Insurance, vestigations, Research, Data processing, Analytical techniques, Meteorology, Climatology.

Identifiers: *Hail data, Hail research, Hail insurance, Crop-hail damage.

The first climatic investigations of hail in North America were by Lemons and Flora during the 1940's. Their investigations were followed by more intensive, state-scale climatic investigations in the 1960's to meet insurance concerns. Subent concerns with hail by the aviation industry sequent concerns with hail by the aviation industry and the weather modification community led to the first collection of mesoscale hail data from e networks and radar studies during the 1960's and 1970's. This paper was a review of available hail information presented in a series of time and space scales. Although the North American hail data and information are less than adequate, there is much more hail information than exists elsewhere in the world. Extensive findings on hail are available for Alberta, Illinois, and Colorado. Phenomenologically oriented studies have focused on hailstones, points hailfalls, hailstreaks, hail-storms, hailswaths, and hail days over various sized areas. Results for each of the classifications were presented according to studies that focused on national, regional, and small-scale area. The principal hail area of the continent is in and to the lee of the Rocky Mountains, where hail is both frequent and intense; hence the Great Plains area suffers great damages. Another high-frequency area related to spring storms extends from Texas to Michigan, but those storms cause less crop damage since they largely precede the crop

season. Certain inexpensive data collection efforts and analyses which would greatly improve our knowledge of hail were recommended. (Sims-ISWS) W77-11598

CONNECTIONS BETWEEN CLIMATE AND

DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environmental

F. K. Hare.

Environmental Conservation, Vol 4, No 2, p 81-90, Summer, 1977. 5 fig, 1 tab, 42 ref.

Descriptors: *Deserts, *Droughts, *Africa, *Rainfall, *Land use, *Arid climates, Arid lands, Semi-arid climates, Tropical regions, Climatic data, Land management, Weather modification, Forecasting, Dry seasons, Soil surfaces, Wind erosion, Meteorology, Weather data, Remote sensing, Meteorological data, Environmental effects, Human population, Microclimatology, Albedo, Stock water, Cultivation, Arable land, Com-

pacted soils, Carrying capacity.
Identifiers: *Descritication, Southern oscillation,
UN Conference on Descritication, Macroclimate,

Despite the severity of the Sahelian drought of 1968-73 there is no firm evidence that a permanent desiccation of the West African arid zone is in progress. Evidence suggests desertification results more immediately from faulty land-use practices interacting with prolonged episodes of natural drought. The spreading of desert surfaces appears to be a process of degradation of grassland, scrub, or savanna ecosystems along desert margins; destruction of perennial vegetation; compaction of soil (especially near watering places); and deflation of fine materials (wind erosion) caused by overstocking or excessive cultivation during periods of desiccation. Because the resulting sur-faces are lighter-colored and reflect more sunlight than native vegetation, they may enhance at-mospheric subsidence and intensify drought. Loss of surface organic litter may also act as a positive feedback for drought. Although adequate methods for predicting such episodes do not yet exist, the use of cyclical variations, where present, time-lagged teleconnections; and general circulation modelling provide three possibilities for prediction. Strategies for desert-margin countries should include examination of climatic, land use, and population growth histories; experimentation in sinfall enhancement techniques; avoidance of destructive forms of land use through control of stocking levels and arable cultivation; detailed forecasting of rainstorm movement by means of satellite imagery; and development of meteorolog-ical modelling capabilities. (Ullery-Arizona)

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71, Direktoratet for Jakt, Viltstell og Ferskvannsfiske, Vollebekk (Norway). Fisheries Research Inst. E. Snekvik, A. R. Selmer-Olsen, A. Njos, and R. Baerug. Meld Nor Landbrukshogsk. 52(13), p 1-19, 1973.

W77-11629

*Precipitation(Atmospheric), *Hydrogen ion concentration, *Chemical analysis, *Regression analysis, *Correlation analysis, Conductivity, Rain, Snow, Zinc.

The chemical analysis of precipitation during the years 1965-71 in Norway is discussed. The material was grouped according to time periods, geographical regions, and kind of precipitation. Regression and correlation analyses have been carried out to investigate the covariation between carried out to investigate the covariation between the analysed variables. The pH was lower in 1969-71 as compared to 1965-68. The average values of pH did not exceed pH 5.5 in any of the small regions used to classify the material. Precipitation from the coastal area showed a higher concentration of Cl, Mg, Na, K and had a higher conductivity than precipitation from the southern inla while there was no significant difference in pH. The NO3-N concentration was almost twice as high in snow as compared to rain, while the total hardness, Cl and SO4-S were highest in rain. This effect is partly confounded with regions. Regression analyses revealed that Zn was a marker of general pollution. The N compounds, NH4-N and NO3-N, seemed to be important variables with respect to the covariation with conductivity. Ninety percent of the total variation in conductiviassociated with the covariation of NH4-N and NO3-N in the southern inland. The pH was negatively correlated with conductivity ar N. This was the case in all regions and in both snow and rain. There was no general negative cor-relation between pH and SO4-S. Samples of snow accumulated over 60 days (snow profiles) had 2-4 times higher concentration of Ca, Mg, Na and K than samples accumulated over 1-3 days. The concentration of NO3-N was 3 times higher in 1-3 day samples than in snow profiles.—Copyright 1974, Biological Abstracts, Inc. W77-11785

PRECIPITATION AS A CHAIN-DEPENDENT

PROCESS, National Center for Atmospheric Research, Boulder, Colo. R. W. Katz.

Journal of Applied Meteorology, Vol 16, No 7, p 671-676, July 1977. 4 fig, 3 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Model Descriptors: "Precipitation(Atmospheric), Models studies, "Pennsylvania, "Mathematical models, Mathematics, "Markov processes, Statistics, Probability, Rainfall, Meteorology. Identifiers: "Markov chain models.

A probabilistic model for the sequence of daily amounts of precipitation was proposed. The model was a generalization of the commonly used Markov chain model for the occurrence of precipitation. Methods were given for computing the dis-tribution of the maximum amount of daily precipitation and the distribution of the total amount of precipitation. The application of the model was illustrated by an example, using State College, Pennsylvania, precipitation data. (Sims-W77-11803

COLLATING AIRBORNE AND SURFACE OB-SERVATIONS OF THE MICROSTRUCTURE OF CONTINENTAL CONVEC-TIVE CLOUDS,

National Center for Atmospheric Research.

Boulder, Colo.

Journal of Applied Meteorology, Vol 16, No 7, p. 697-707, July 1977. 10 fig, 3 tab, 12 ref.

*Cloud physics, Descriptors: Precipitation(Atmospheric), Aircraft, Clouds, Proplets, Particle size, Ice, Photography, Cameras, On-site investigations, On-site data col-lections, Analytical techniques, Data processing, Meteorology.
Identifiers: Sailplane observations, Surface observations, Cumulus clouds.

The observational results from sailplane flights into the updrafts of developing cumulus clouds in northeastern Colorado showed some important variations in the microstructure of the cloud droplet and ice particle distributions. Some of the variations apparently are caused by the combined interactions of cloud droplets and precipitation particles with the horizontal and vertical com-ponents of the updraft and its horizontal and vertical structure. Data from the observations were introduced into a circulation framework in an at-tempt to understand how the microphysics and the circulation can interact to give the features ob-served. The results cast doubt on the validity of

Group 2B—Precipitation

the often made assumption that the microphysical properties of a cloud are distributed randomly with respect to each other on the smaller scales, and that this condition exists uniformly throughout the cloud. The observed precipitation shafts with bimodal size distributions in the middle and lower parts of a cloud can be recreated in a two-dimensional simulation of the observed cloud air circulation with embedded microphysics. The observed and calculated frozen water content can increase by one to two orders of magnitude over the liquid water content when moving from cloudy air into a precipitation shaft. The observed change in concentration with height of the ice particles exceeds (by over two orders of magnitude) the expected ice nuclei concentration usually found in the atmosphere at comparable temperatures. The average concentrations of ice particles observed occasionally exceed 400/liter. (Sims-ISWS)

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART I: MEASURED EFFECTS ON CLOUDS.

Naval Weapons Center, China Lake, Calif.

Research Dept. E. E. Hindman, II, P. V. Hobbs, and L. F. Radke. Journal of Applied Meteorology, Vol 16, No 7, p 745-752, July 1977. 4 fig, 3 tab, 12 ref. NSF ENV75-19701.

Descriptors: *Pulp and paper industry, *Clouds, *Nucleation, *Washington, Cloud physics, Aircraft, Measurement, Particle size, Droplets, Industry, *Air pollution effects, Environmental effects, *Air pollution effects, Environmental effects, *Air pollution effects, *Environmental effects, *Air pollution effects, *Environmental effets, *Environmental effects, *Environmental effets, *Envi Atmosphere, Atmospheric physics, Meteorology.

Identifiers: *Paper mills, *Cloud condensation

nuclei, *Port Townsend(Wash).

The effluents from a large Kraft-process paper mill were found to increase the concentration of large (0.2-2 micrometers diameter) and giant (greater than 2 micrometers diameter) cloud condensation nuclei (CCN) above background concentrations; the concentrations of small (less than 0.2 micrometer diameter) CCN, however, were not increased significantly. Small, nonraining, warm cumulus clouds located in the plume of the paper mill were found to contain higher concentrations of droplets greater than 30 micrometers diameter than similar clouds located outside of the plume; the clouds in both locations contained similar concentrations of droplets greater than 5 micrometers diameter. Cloud droplet size distributions calculated using the CCN measurements are consistent with the measured droplet size distribu-tions. It was concluded that the large and giant CCN from the paper mill increased the concer tions of droplets greater than 30 micrometers diameter in clouds located in its plume. Furthermore, the clouds located in and out of the plume contained similar concentrations of droplets greater than 5 micrometers diameter because the concentrations of small CCN in the plume and in ambient air were similar. (See also W77-11806) (Sims-ISWS) W77-11805

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART II: CALCULATED EFFECTS ON RAINFALL,

Naval Weapons Center, China Lake, Calif. Research Dept.

E. E. Hindman, II, P. M. Tag, B. A. Silverman, and P. V. Hobbs.

Journal of Applied Meteorology, Vol 16, No 7, p 753-755, July 1977. 2 fig, 16 ref. NSF ENV75-19701.

*Pulp and paper industry, *Rainfall, *Nucleation, *Washington, Environmental effects, *Air pollution effects, Particle size Droplets, Model studies, Mathematical models, Cloud physics, Clouds, Atmospheric physics, Meteorology. Descriptors: *Pulp and paper industry, *Rainfall,

Identifiers: *Paper mills, *Cloud condensation nuclei, *Port Townsend(Wash).

The paper mill at Port Townsend, Washington, is a source of large and giant condensation nuclei (CCN). The CCN cause the concentrations of droplets greater than 30 micrometers in diameter to be higher in small, nonraining warm clouds located in the plume of the mill than in similar clouds unaffected by the plume. Calculations based on a model for nonsheared, warm cumulus clouds and on a model for warm stratus clouds indicated that the higher concentrations of large droplets in the clouds in the plume should not cause any significant changes in the rainfall from the clouds. The results indicated that the large and giant CCN emitted by the mill are not responsible by themselves for the increased rainfall measured in the vicinity of the mill. The heat and moisture nt CCN emitted by the mill are not responsible emitted by the mill, in combination with the CCN, may have been responsible for the increased rainfal. (See also W77-11805) (Sims-ISWS) W77-11806

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES.

Scripps Institution of Oceanography, La Jolla, For primary bibliographic entry see Field 2L. W77-11817

AFRICAN RAINFALL AND ITS RELATION TO THE UPPER AIR CIRCULATION.

Massachusetts Inst., of Tech., cambridge. Dept. of Meteorology.

J. W. Kidson. Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 437, p 441-456, July 1977. 13 fig, 1 tab, 25 ref, 1 append. NSF DES74-09853 A02.

Descriptors: *Rainfall, *Air circulation, *Africa, *Droughts, *Rainfall distribution, Climatic data, Foreign research, Climatology, Foreign countries, Circulation, Water vapor, Moisture content, Albedo, Precipitation(Atmospheric), Distribution patterns, Spatial distribution, Temporal distribution, Data processing, Meteorology. Identifiers: *Sahel region(Africa)

The rainfall distribution over Africa analyzed for the period 1951-1975 showed a downward trend at 15 deg N not present at other latitudes. A widespread reduction in rainfall was observed during the drought years 1972 and 1973. Upper air analyses were used to construct mean m vertical motion patterns and water vapor budgets, but the results were not sufficiently precise to ex-amine year-to-year differences. Changes in the August flow patterns showed that low rainfall in the Sahel is associated with the virtual disap-pearance of the 850-mb trough near 8 deg N and weakening of the easterly jet above it. An empirical orthogonal function analysis of the 850-, 500-and 200-mb temperatures from 150 stations showed that the changes are global in extent. The downward trend in the Sahel rainfall evidently has been paralleled by a weakening of the northern hemisphere circulation. The results suggest that local modification of surface conditions is not the principal cause of the decline in Sahel rainfall over the last two decades. (Sims-ISWS) W77-11820

AN ELECTRON MICROSCOPY STUDY OF PARTICULATES PRESENT IN INDIVIDUAL

RAINDROPS, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Metallurgical and Materials En-

T. W. Gonzales, and L. E. Murr. Journal of Geophysical Research, Vol. 82, No. 21, p 3161-3166, July 20, 1977. 5 fig, 18 ref. Descriptors: *Raindrops, *Sampling, *Electron microscopy, Rainfall, Storms, Laboratory tests, Microscopy, Silicates, Asbestos, Kaolinite, Parti-cle size, Cloud physics, Meteorology. Identifiers: *Particulates, *Raindrop scavenging,

A technique for collecting single raindrops for the observation of particulates by transmission electron microscopy was described. Measurement of particulate concentrations in raindrops during the course of rainstorms over central New Mexico has shown that the particulate concentrations increase from the onset of rain, reaching a maximum concentration which then declines exponentially with elapsed time. The particulates were observed to vary in size from less than 0.01 to 3 mu, with a mean particle size of 0.1 mu. Essentially all of the particulates were observed to be crystalline or polycrystalline aggregates composed mainly of micas, kaolinites, and other layer silicates. The particulate morphologies exhibited a preponderance of platelike structure or aggregates possessing a large surface-to-volume ratio. Asbestiform fibers were not abundant in the distribution of scavenged particulates, and the dearth of observations of such fibers in raindrops for this particular area supports earlier conclusions that very high fiber concentrations in potable water of the region have their origin in geologic or hydrologic mechanisms. (Sims-ISWS)

A NUMERICAL SIMULATION OF WARM FOG DISSIPATION BY ELECTRICALLY ENHANCED COALESCENCE: PART II. CHARGED DROP SEEDING,

Naval Environmental Prediction Research Facili-

P. M. Tag.

Journal of Applied Meteorology, Vol 16, No 7, p 683-696, July 1977. 14 fig. 1 tab, 29 ref.

Descriptors: *Fog, *Droplets, *Mathematical models, Model studies, Numerical analysis, Simulation analysis, Cloud physics, Meteorology, Mathematical studies.

Identifiers: *Fog dissipation, *Charged drops, Warm fog, Collision efficiencies, Coalescence, Electrical charges, Drop charging, Visibility, Fog seeding, Electrostatic effects.

A numerical study of the use of highly charged water drops to clear warm fog was conducted. The mechanism studied was the polarization of neutral fog droplets and their capture by the charged drops. A multi-level microphysical model was used to investigate the degree of visibility improvement resulting from variations in seeding drop size and charge, the concentration of seeding material, and the fog being seeded. It was determined that visibility improvement decreases with decreasing fog droplet size, and increases with increasing seeding rate and seeding drop charge. For the same amount of seeding water, a trespectrum with an average radius between 10 and 15 micrometers is ideal. In contrast to the findings of Part I (an applied electric field), visibility improvement here results both from a removal of fog water (to the ground) and from a transfer of water from the fog spectrum to the larger treatment drops. Field tests of the technique have proven in-conclusive. A further evaluation was made by comparing model results to comparable numerical experiments of hygroscopic seeding, a technique that has been field tested on several occasions. It was concluded that the charges and treatment concentrations simulated in this study would not be adequate for clearing fog; unless charges and seeding concentrations can be greatly increased, charged drop seeding is probably not a viable fog pation technique. (Sims-ISWS)

RAINFALL PARAMETERS TO PREDICT SURFACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES, Rhodesia Dept. of Conservation and Extension,

Salisbury. H. A. Elwell, and M. A. Stocking. Rhod J Agric Res. 11(2), p 123-129, 1973.

Descriptors: *Rainfall, *Forecasting, *Runoff, Soils, Seasonal, Storms, Precipita-Soils, Seasonal, Storms, Precipita-tion(Atmospheric).

Identifiers: *Rhodesia(Highweld region), *Soil losses(Rainfall).

A rainfall parameter which represented the cumulative seasonal momentum values of all storms proved to be the best predictor of direct surface runoff yield from selected field plots on the Rhodesian highveld. Total seasonal precipitation gave slightly better results than an equivalent energy parameter. There was a close relationship een soil loss and surface runoff quantities which suggest that prediction equations can be developed for both quantities from the same data source. In addition, rainfall parameters proved to be more dependable as estimators of runoff than of soil loss. --Copyright (C) 1974, Biological Abstracts, Inc. W77-11964

EFFECT OF RAINFALL-EXCESS DETERMINA-TION ON RUNOFF COMPUTATION,

New Mexico Inst. of Mining and

V. P. Singh, and S. Buapeng. Water Resources Bulletin, Vol 13, No 3, p 499-514, June 1977. 10 fig, 4 tab, 26 ref.

Descriptors: *Rainfall, *Rainfall-runoff relation-ships, *Model studies, Rainfall disposition, Ruships, *Model studies, Rainfall disposition, Ru-noff, Kinetics, Infiltration, Infiltration rates, Watersheds(Basins), Overland flow, Precipitation excess, Surface runoff, Runoff forecasting, Soil

Identifiers: Kinematic wave, Converging overland flow model, Infiltration estimates, Hydrograph

Four methods of determining rainfall-excess were considered. The methods considered were phiindex and equations of Norton, Kostyakov, and Philip. The methods were utilized in a nonlinear kinematic wave model to predict surface runoff from two natural agricultural watersheds. The effect of determing rainfall-excess on surface runoff response was examined. It was observed that errors in rainfall-excess constitute a major source of error in runoff prediction. The choice of a method of determining rainfall-excess is crucial to runoff computation. Of the four methods considered, Horton's equation was the best. The equations of Philip and Kostyakov were comparable, and phiindex grossly misrepresented rainfall-excess. It was shown that errors in hydrograph computation can be minimized considerably by the use of a more refined method of infiltration. (Roberts-ISWS) W77-11986

SHORT PERIOD FLUCTUATIONS OF NEW

ZEALAND RAINFALL, New Zealand Meteorological Service, Wellington.

w Zealand Journal of Science, Vol 19, June, 1976, p 149-161, 6 fig, 4 tab, 15 ref.

Descriptors: *Rainfall, Forecasting, *Projections, *Analytical techniques, *Fluctuations, Meteorology, Weather forecasting, Seasonal, Cycles, Weather data, Synoptic analysis, Climatology, Reions, Stations, Circulation, Orography, Theoretical analysis.

*New Zealand, *Extrapolation Identifiers: techniques, Spectral analysis techniques, Synoptic meterology, General circulation theory. An investigation of the relation of quasi-biennial oscillation (QBO) and the 28-day osciallation corresponding to a solar or lunar cycle to rainfall fluc-tuations in New Zealand indicates extrapolation of carefully detected rainfall cycles could be valuable in forecasting rainfall up to several seasons ahead. Rainfall data for 1941-74 from 340 stations in New Zealand were analyzed for fluctuations and spectral densities and significant periodicities obtained. Stations were combined into correlated groups to remove site effects and ensure regional application of the results. QBO was the most common periodicity detected over most of the country. A 28-day oscillation was significantly related to recorded rainfall in one region. Several significant but transient, oscillations of 200 days or less were detected. (Ullery-Arizona)

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY

MANAGEMENT, Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

PROBLEMS OF APPLYING THE CONCEPTUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY. Research Inst. for Water Resources Development,

Budapest (Hungary). For primary bibliographic entry see Field 2A. W77-12087

CONVECTIVE STORM FIELD SIMULATION FOR DISTRIBUTED CATCHMENT MODELS, California Univ., Davis. Dept. of Water Science

and Civil Engineering.
J. Amorocho, and D. Morgan

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 598-607, 1974. 3 fig. 2 tab. 10 ref.

Descriptors: *Watersheds(Basins),
*Precipitation(Atmospheric), *Model studies,
*Simulated rainfall, Simulation analysis, Com-Thundated rainali, Simulation analysis, Computer models, Mathematical models, Meteorology, Thunderstorms, Rainfall, Rainfall disposition, Areal, Distribution patterns, Convection, Analytical techniques, Hydrologic aspects, Storms, Rainfall intensity, Isohyets, Mapping.

Convective storms of the types conducive to the generation of summer floods were studied in detail from ground data obtained in dense rain gage networks. Procedures of storm frequency distribution analysis, cumulus convection modelling, and systematic sampling of the rainfall intensities were used in a process for the simulation of the storm fields at ground level. The fields can be used in conjunction with distributed catchment models for the generation of synthetic flood sequences suitable for engineering design and water resources systems planning. The process described permits the simulation of a succession of storm fields over a semiarid area similar to those encountered in the United States in the States of Arizona and New Mexico. It is believed that although somewhat idealized, the patterns given by the simulation will produce catchment responses which are closer to actual watershed behavior than the lumped (space invariant) rainfall inputs which are necessary the absence of dense rain gage networks. (See also W77-06708) (Humphreys-ISWS) W77-12092

MATHEMATICAL MODEL OF THE HYDROMETEOROLOGICAL REGIME FOR-MATION OF A RIVER BASIN, Gosudarstvennyi Gidrologicheskii

Institut. Moscow (USSR).
For primary bibliographic entry see Field 2A.

W77-12102

2C. Snow, Ice, and Frost

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES,

San Diego State Univ., Calif. Dept. of Chemistry. M. M. Herron, C. C. Langway, Jr., H. V. Weiss, R.

J. Hurley, and R. J. Kerr.

Available from the National Technical Information tion Service, Springfield, VA 22161 as AD-A029 356, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-24, July 1976. 6 p, 2 tab, 16 ref. NSF OPP 750-6750.

Descriptors: *Ice, *Snow, *Chemical analysis, *Dating, *Trace elements, Geologic time, Sodium, Chlorides, Volatility, Pollutants, Aerosols, Air pollution, Mercury, Zinc, Manganese, Aluminum, Foreign countries, Foreign research, Annual. Identifiers: *Vanadium, *Greenland, *Ice cores, Annual course publications of the cores, Annual course publications. Annual accumulations.

Chemical analysis of surface snows and deeper ice core samples from Milcent, Greenland, indicated a marine origin for Na and Cl and a terrestrial origin for Al, Mn and V. Pre-1900 enrichment factors, based on average crustal composition, are high for Zn and Hg and appear to be related to their volatility. A comparison of pre-1900 and 1971-1973 concentrations of V and Hg showed no decided increase from industrial production; however, the abundance of Zn (relative to A1) increased threefold during the mentioned time period. Informa-tion concerning the chemical composition of ancient ice is extremely useful in interpreting modern aerosols. (Henley-ISWS) W77-11586

A METHOD OF ESTIMATING THE PROBA-BILITY OF OCCURRENCE OF SNOW WATER EQUIVALENTS IN THE UNITED KINGDOM, British Meteorological Office, Bracknell

(England). For primary bibliographic entry see Field 4A.

TEXTURAL CHARACTERISTICS OF DRIFT FROM SOME REPRESENTATIVE CORDIL-LERAN GLACIERS, Washington Univ., Seattle. Dept. of Geological

H. H. Mills. Geological Society of America Bulletin, Vol. 88, No. 8, p 1135-1143, August 1977. 8 fig, 31 ref.

Descriptors: *Glacial drift, *Glacial sediments, *Particle size, *Washington, *Canada, *Glaciers, Mountains, Soils, Soil texture, Glacial soils, Sediments, Statistics, Frequency curves, Analytical techniques, Geomorphology, Glaciology. Identifiers: *Cordilleran glaciers.

Particle-size analyses of more than 300 samples of drift from Nisqually, Paradise, and South Cascade Glaciers in the Cascade Range of Washington, from Athabasca Glacier in Alberta, Canada, and from other alpine glaciers showed that textural differences exist among glaciers and among glacier subenvironments. Differences among glaciers probably reflect bedrock terrane and are shown by the percentage of silt + clay in the less than -1.00 phi fraction, which increases in the following order: Nisqually and Paradise (volcanic bedrock), South Cascade (metamorphic and plutonic bedrock), and Athabasca (sedimentary bedrock). Differences among subenvironments are shown best by analyses of samples which include clasts as large as -6.67 phi; average frequency curves of the samples show that basal tills lack dominant modes in the coarse fraction and may have domi-nant modes in the fine fraction at about 4.00 phi, whereas sediments of other subenvironments pos-sess dominant modes in the coarse fraction at or

Group 2C-Snow, Ice, and Frost

above about -5.00 phi. Mean size and sorting increase, and percentage of silt + clay decreases in the following order: basil till, recessional-moraine till, end-moraine till, ablation drift, and stratified drift. Skewness, but not kurtosis, also varies with subenvironment. A comparison of alpine drift with continental ice-sheet drift from Ontarios showed that, in general, alpine drift is coarser, but that alpine basal till is comparable to ice-sheet basal till.
When comparing nonglacial diamictons to alpine drift, it may be possible to distinguish the former from the sediments of one glacier subenvironment but not from those of another. (Sims-ISWS)

NOAA-ARS COOPERATIVE SNOW RESEARCH PROJECT. WATERSHED HYDRO-CLI-MATOLOGY AND DATA FOR WATER YEARS

1960-1974, National Weather Service, Silver Spring, Md. Of-

fice of Hydrology. E. A. Anderson, H. J. Greenan, R. Z. Whipkey, and C T Machell

June 1977. 311 p, 36 fig, 13 tab, 24 ref, 8 append.

Descriptors: *Watersheds(Basins), *Snow cover, *Precipitation(Atmospheric), *Vermont. Watershed management. Identifiers: Hydro-climatology.

Data are provided for the 3.25 square mile W-3 watershed which is part of the Sleepers River Research Watershed operated by the Agricultural Research Service near Danville, Vermont. Presented are streamflow, air temperature, snow course, pan evaporation, and soil-moisture data, as well as point measurements and mean areal estimates of precipitation. Also included are data from the NOAA-ARS Snow Research Station which is located adjacent to the W-3 watershed. Detailed measurements of the snow cover and the hydro-meteorological variables affecting snow cover energy exchange have been made since December 1968 at this station as part of a cooperative project to study the physical processes involved in snow metamorphosis and snowmelt. Tabulations of some of the watershed and snow cover variables are included. The remaining variables are sum-marized. Most of the actual data are contained on an associated magnetic tape. In addition to the data, information is provided as to the quality of the data and the hydro-climatology of the watershed. This set of data is suitable for use in developing and testing physically based hydrologic models. The watershed is hydrologically representative of most of the glaciated upland regions of the Northeastern United States. (NOAA)

OBSERVATIONS OF MEDIUM-SCALE FEA-TURES ALONG THE SEASONAL ICE EDGE IN

THE BERING SEA, National Oceanic and Atmospheric Administra-tion, Seattle, Wash. Pacific Marine Environmental

R. D. Muench, and R. L. Charnell.

Journal of Physical Oceanography, Vol 7, No 4, p 602-606, July 1977. 5 fig, 1 tab, 6 ref. NOAA-NESS 5-35190.

Descriptors: *Ice, *Sea ice, *Ice-water interfaces, *Alaska, Ice cover, Remote sensing, Satel-lites(Artificial), Temperature, Water temperature, Winds, Clouds, Atmosphere, Convection, Winter, Cold regions.
Identifiers: *Bering Sea, Ice bands, Ice features.

During winter 1974-75, band-like ice features were observed via satellite in the Bering Sea water-ice transition zone during periods of off-ice winds The band-like ice features were several tens of kilometers long, were spaced from 6-12 km apart, and generally were oriented from 40-90 deg left of the surface wind direction. Formation of the features appears to be related to atmospheric convective processes; such features may be significant in-

dicators of transition zone ice dynamics. (Sims-ISWS) W77-11809

FORCE MEASUREMENTS ON A NAVIGABLE ICE BOOM, ARCTEC, Inc., Columbia, Md.

M. S. Uzuner, J. J. Peter, and D. C. N. Robb.

Journal of Hydraulic Research, Vol 15, No 2, p 179-187, 1977. 7 fig. 4 ref.

Descriptors: *Ice cover, *Rivers, *Ice loads, *St Lawrence Seaway, Navigation, Winter, Loads(Forces), On-site investigations, Instrumentation, Measurement, Ice, Rivers, Ships, Cold re-

Identifiers: *Ice booms, Winter navigation.

The St. Lawrence Seaway Development Corporation has been assigned the task of demonstrating the feasibility of winter navigation on the St Lawrence River. As a part of the program, an ice boom was designed, installed, and instrumented at Copeland Cut in the Wiley-Donden Canal near Massena, New York. In order to measure forces exerted on the boom elements by the ice cover, 20 tension transducers were designed, built, and located in the critical members of the boom. Force measurements were made before, during, and after ship transits through the ice cover and boom opening. Typical signal recording of several of the tension transducers was presented. It was concluded that, within the flow velocities experienced at the test site, an ice boom with a navigation channel is feasible. Ship induced forces were found to be relatively small compared to steady-state forces, and they were limited primarily to the gate float area. It was found that the effect of the water surface elevation fluctuations must be considered also during the design when it is necessary to anchor the shoreside ends of boom cables well above the water level. (Sims-ISWS) W77-11814

MATHEMATICAL MODEL OF SPRING RU-NOFF FORMATION, Hydrometeorological Service of the USSR.

Moscow.

For primary bibliographic entry see Field 2A. W77-12101

SIMULTANEOUS PASSIVE AND ACTIVE MICROWAVE OBSERVATIONS OF NEAR-SHORE BEAUFORT SEA ICE, Tacoma, Wash. Water Geological Survey,

Resources Div. W. J. Campbell, P. Gloersen, H. J. Zwally, R. O.

Ramseier, and C. Elachi.

Paper presented at the 9th Annual Offshore Technology Conference, held in Houston, Texas, May 2-5, 1977, p 287-294, 1977. 9 fig, 10 ref.

Descriptors: *Sea ice, *Remote sensing, *Arctic Ocean, *Aircraft, *Infrared radiation, Microwaves, Analytical techniques, Floating, Ice. Identifiers: *Beaufort Sea, *Sea-ice morphology, *Microwave imagery.

The use of active and passive microwave imagery in combination is the optimum way to observe the morphology and dynamics of near shore ice. Active and passive microwave data from aircraft that are described in this paper are also compared to the ESMR (Electricially Scanning Microwave Radiometer) imagery of the Nimbus-5 satellite. The information thus obtained shows how the data to be received from the SAR (Synthetic Aperture Radar) and SMMR (Scanning Multichannel Microwave Radiometer) and on Seasat A and Numbus G have the potential of providing a vastly increased understanding of the near shore ice of the Beaufort Sea. (Woodard-USGS) W77-12157

2D. Evaporation and Transpiration

THE DIVERGENCE OF THE WATER VAPOUR FLUX OVER SOUTHERN AFRICA, Natal Univ., Pietermaritzburg (South Africa). Dept. of Geography.

O. S. McGee. Water SA., Vol. 2, No. 2, p 73-85, 1976. 1 fig, 1 tab. 13 ref.

Descriptors: *Water vapor, *Moisture content, Theoretical analysis, Topography.
Identifiers: South Africa, Radiosondes.

Data from all available radiosonde ascents during 1967 over South Africa are used to determine the annual water vapour flux divergence. A theoretical approach is given in some detail as well as certain explanations as to why results appear unrealistic at first sight. The need appears for a closer appraisal of topographical influences and the acceptance of a possible transport of vapour through the upper level at which customarily, it is assumed that there is no such transport. (So African Water Info Center) W77-11579

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY, Soils and Irrigation Research Inst., Potchefstroom (South Africa)

For primary bibliographic entry see Field 3F. W77-11580

SUBSTANTIATION OF THE PRIESTLEY AND TAYLOR PARAMETER ALPHA = 1.26 FOR POTENTIAL EVAPORATION IN HIGH LATITUDES,

Atmospheric Environment Service, Downsview (Ontario).

R. B. Stewart, and W. R. Rouse.

Journal of Applied Meteorology, Vol 16, No 6, p 649-650, June 1977. 1 fig, 7 ref.

Descriptors: *Evaporation, *Lakes, *Model studies, *Canada, Equations, Latent heat, Energy budget, Temperature, Energy, Heat, Summer, Heat transfer, Water loss, Saturated soils, Water

vapor.
Identifiers: *Potential evaporation, Shallow lakes, Sedge meadows, High latitudes.

Summertime latent heat flux values determined by the energy budget approach were compared to equilibrium model estimates for two shallow lakes and two sedge meadow surfaces in northern ada. Comparison of energy budget values with equilibrium estimates for each surface showed that the latent heat flux can be determined accurately by the Priestley and Taylor model, where, alpha, the ratio of actual to equilibrium evapora-tion equals 1.26 Results suggested that the Priestley and Taylor parameter generally is appicable t saturated surfaces in high latitudes. (Sims-ISWS) W77-11599

NOTE ON EVAPOTRANSPIRATION BY PROFILE-DEPLETION METHOD IN DEEP VERTISOL.

College of Agriculture, Indore (India). Dryland Agriculture Research Project. R. K. Katre, and M. B. Russell.

Indian Journal of Agricultural Sciences, Vol 44, No 11, p 781-782, November 1974. 1 fig.

Descriptors: *Evapotranspiration, *Soil moisture, *Withdrawal, *Soil profiles, Wheat, Water sampling, Soil-water-plant relationships, Dry farming, Water utilization, Fallowing, Soil analysis, Seasonal, Estimating.
Identifiers: *India, Vertisol.

A study was conducted to evaluate the effect of sampling depth on seasonal profile water depletion

Streamflow and Runoff—Group 2E

and total water use under fallow and unirrigated wheat in vertisol on a research farm of Jabalpur, India. Profile-moisture sampling methods are described. The total seasonal profile depletion to depths of 80, 100 and 200 cm from sowing to harvest were 5.8, 6.8 and 9.6 cm under fallow and 11.9, 14.8 and 20.7 cm under unirrigated wheat. There was no difference between fallow and unirrigated wheat in the ratio of seasonal profile depletion from the 80-cm and 200-cm profiles, or in the non from the su-can and 200-cm profiles, or in the pattern of depletion. The total seasonal water use on the basis of seasonal profile depletion depths of 80, 100 and 200 cm under unirrigated wheat was 18.0, 20.9 and 26.8, respectively. It was concluded that estimates of water use based on depletion data to a depth of 200 cm will be higher and more likely correct than those from 80- or 100-cm denths. (Jahns-Arizona) W77-11632

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO TO EVAPOTRANSPIRATION AND SEDIMENTA-TION, Geological

Survey, Tucson, Ariz. Resources Div.

Resources Liv. F. P. Kipple. For sale by Supt. of Documents, GPO, Washing-ton, DC 20402, price \$2.00. Professional Paper 655-N, 1977. 40 p, 40 fig, 26 tab, 20 ref.

Descriptors: *Evapotranspiration, *Hydrologic budget, *Reservoirs, *Arizona, *Sedimentation, Reservoir silting, Evaporation, Precipitation(Atmospheric), Runoff, Reservoir storage, Usable storage, Inflow, Groundwater, Surface waters, Discharge(Water), Bank storage,

Hydrologic data. Identifiers: *San Carlos Reservoir(Ariz).

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Reservoir data records were used in an investigation of evapotranspiration from the land area of San Carlos Reservoir, Ariz., and evaporation from the water-surface area. A water-budget analysis indicates that the evapotranspiration loss was 11.3 percent and the evaporation loss was 10.5 percent of the total outflow from the reservoir during 1931-71. The water-budget computations were used to develop ratings relating lake stage to usable bank storage. The rating developed for the 1948-71 period indicates that usable bank storage is approximately 159,000 acre-ft, or about 14 percent of total usable storage capacity, if the reservoir is filled to the spillway level of 2,511 ft. A procedure was developed to simulate sediment deposition in the reservoir. The procedure was used to estimate the change in storage capacity between five reser-voir capacity surveys made during the period 1914-66. (Woodard-USGS)

ESTIMATING EVAPORATION AND TRANS-PIRATION FROM A ROW CROP DURING IN-COMPLETE COVER,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 3F. W77-11947

WATER TRANSPORT IN WHEAT PLANTS IN

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics. For primary bibliographic entry see Field 3F. W77-11949

NEW TECHNIQUE FOR MEASURING THE WATER POTENTIAL OF DETACHED LEAF

Intermountain Forest and Range Experiment Sta tion, Ogden, Utah. For primary bibliographic entry see Field 7B. W77-12117

ALGORITHM FOR SOLAR RADIATION ON MOUNTAIN SLOPES. Forest Service (USDA), Franklin, N.C. Coweeta

Hydrologic Lab. For primary bibliographic entry see Field 7B.

W77-12135

FIELD STUDIES OF THE CONDUCTANCE OF WHEAT LEAVES AND TRANSPIRATION, Commonwealth Scientific and Industrial Research

Organization, Canberra (Australia). Div. of Environmental Mechanics. For primary bibliographic entry see Field 3F. W77-12175

2E. Streamflow and Runoff

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS.

Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W77-11582

SOME BASIC CONCEPTS ON FLOW IN BRANCHING CONDUITS, Wisconsin Univ., Madison. Dept. of Civil and En-

vironmental Engineering. For primary bibliographic entry see Field 8B. W77-11591

TURBULENT FLOW IN VERY NONCIRCULAR

CONDUIT, Research Council of Alberta, Edmonton. Trans portation and Surface Water Engineering Div. For primary bibliographic entry see Field 8B. W77-11592

WATER YIELD CHANGES AFTER THE UR-BANIZATION OF THE CANON'S CATCHMENT, HARLOW, ENGLAND, University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.

W77-11600

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION, Karlova Universita, Prague (Czechoslovakia). J. Andel, and J. Balek.

Hydrological Sciences Bulletin, Vol. 22, No. 1, p 163-173, March 1977. 9 fig. 1 tab, 4 ref.

Descriptors: *Model studies, *Graphical analysis, *Hydrology, Hydrodynamics, Filters, Statistical methods, Phase diagrams, Discharge(Water), Frequency, Foreign research.
Identifiers: *Hydrologic sequences, Demodulation, Amplitude, Periodic components, Phase,

A model which detects the stability of the amplitude and phase of periodic components pro-vided information on the disturbances which may have influenced the formation sequences within an observation period. The model was applied in combination with another model to detect the most frequent periodicities. The model was developed in an attempt to establish a bridge between a statistical analysis of the hydrological pheno and the physical meaning of the results obtained. There were several factors which may have influenced the formation of the periodic components in hydrological sequences: sunspots and atmospheric fluctuations, long-term fluctuations of into spierte Intertations, one-term intertations on the regional and local climate, vegetation changes, and blockage of the outflows from lakes. The above mentioned factors were typical phenomena which could have developed periodic components, and, when disturbed either naturally or artificially,

they may have disturbed the components in a similar way. Also, sudden changes, such as those caused by urbanization and water and agricultural management, may have produced other types of disturbances which were reflected in the shape ansurbances which were reflected in the shape and stability of the amplitude and phase diagrams. The relationship can be traced between the phenomena and corresponding periodicities by analyzing diagrams in the paper. (Roberts-ISWS) W77-11602

A STOCHASTIC MODEL FOR THE SIMULA-

TION OF DAILY FLOWS, Karlsruhe Univ. (West Germany). Institut fuer Wasserbau III.

Wasserbau III. B. Treiber, and E. J. Plate. Hydrological Sciences Bulletin, Vol. 22, No. 1, p 175-192, March 1977. 16 fig, 7 ref.

Descriptors: *Stochastic processes, *Model studies, *Flow, Daily hydrographs, Synthetic hydrology, Floods, Floodwater, Markov dies, 'Flow, Daily inydrographs, Synthetic hydrology, Floods, Floodwater, Markov processes, Hydrology, Peak discharge. Identifiers: 'Stochastic models, 'Daily flow, Daily streamflow, Synthetic daily streamflow, Markov chain model.

Existing models for generating synthetic daily streamflow data are unsuitable for reproducing the predominant features of daily flows, the rising and recession of flood flows, the peaks of the floods, the volume of the waves and the range. In this paper, a model was presented which is able to reproduce the important features of daily flows. In the model the measured record of daily data is assumed to be the output of a linear system. The input of the system consists of pulses, occurring on certain days. The pulses are convoluted with the system function in order to produce the output. The form of the system function depends on the The form of the system function depends on the magnitude of the output. First, on the days on which pulses occur the magnitude of pulses and the form of the system function as a function of the system output are determined. Subsequently, a model was developed for the generation of the pulse. The model occurrence of the constitution of the pulse. ses. The model consists of a combination of two processes. Using a Markov chain model, the sequence of dry and wet days (days with and without pulses) is generated. Thereafter, a pulse of certain magnitude is assigned to each wet day. A modified first-order autoregressive process is used to produce the correlated pulses. The random to produce the correlated pulses. The random components of the pulses are taken from a transformed exponential distribution. The periodicity of the flows within the year is reproduced by using different model parameters for each month of the year. The model yields good results for small and medium size basins, especially as far as peak flows, the volume of the waves, and the range are concerned. A sequence of daily flows from at least concerned. A sequence of daily flows from at least 20 years is required for input data. (Lee-ISWS) W77-11603

THE MONTE CARLO APPROACH TO OP-TIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS, Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 4A.
W77-11604

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST, Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab. For primary bibliographic entry see Field 4C. W77-11613

LOW FLOW CRITERIA FOR DIVERSIONS AND IMPOUNDMENTS,
Geological Survey, Menlo Park, Calif. Environmental and Safety Section.

For primary bibliographic entry see Field 4A. W77-11778

Group 2E-Streamflow and Runoff

THE INTEGRATED HYDROLOGICAL CATCHMENT MODEL EGMO, Institut fuer Wasserwirtschaft, Berlin (East Ger-

For primary bibliographic entry see Field 2A. W77-11815

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11880

HYDROLOGIC UNIT MAP--1974, STATE OF ARKANSAS.

Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11881

HYDROLOGIC UNIT MAP--1974, STATE OF KENTUCKY.
Geological Survey, Reston, Va. Water Resources

Div. For primary bibliographic entry see Field 7C. W77-11882

HYDROLOGIC UNIT MAP--1974, STATE OF

Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11883

HYDROLOGIC UNIT MAP--1974, STATE OF TENNESSEE.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11884

HYDROLOGIC UNIT MAP--1974, STATE OF

MISSOURI. Geological Survey, Reston, Va. Water Resources Div

For primary bibliographic entry see Field 7C. W77-11885

MORPHOLOGY AND MORPHOMETRY OF A CHANNELIZED STREAM: THE CASE HISTORY OF BIG PINE CREEK DITCH, BENTON, COUNTY, INDIANA, STUDIES IN FLUVIAL GEOMORPHOLOGY NO. 4,

Purdue Univ., Lafayette, Ind. Dept. of Geosciences.

R. S. Barnard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 468,
Price codes: A06 in paper copy, A01 in microfiche.
Purdue University Water Resources Research
Center, Technical Report No. 92, June 1977. 86 p,
30 fig, 4 tab, 5 plates, 27 ref. OWRT-A-035-IND(1).

Descriptors: *Channel Improvement, *Channel Morphology, *Meanders, *Stream Stabilization, *River training, Bank stability, Channel erosion, Flood control, sediment control, Slope stability, Stream improvement, Channel flow, discharge regime, Shape, Slopes, Width, Drainage ditches, Scour, Braiding, Sediment load, Streambeds, Piles, Riprap, Flood plain, Indiana. Identifiers: *Channel Morphometry, Pool-Riffle. *Channel Morphometry, Pool-Riffle.

Stream channelization results in dislocation of the fluvial regime which are in opposition to the dynamics of natural stream flow. Streams tend to maintain a certain channel form, sinuosity, slope, and load characteristic, so that when one of these

parameters is altered, the open thermodynamic system tends to adjust other parameters to regain a quasi-equilibrium state. Big Pine Creek Ditch, in Benton County, Indiana, was channelized in 1932. Subsequent changes in channel form and slope have caused considerable lateral migration, scour and fill at various points down the 7 mile channelized reach. A study of this test stream includes an assessment of the cross-sectional and morphometric deterioration, as meander development and profile adjustments have considerably reduced the channel's drainage capacity. Causes for deterioration are determined and relationship found between stream power and sinuosity. Definition of these relationships has allowed the recognition of design errors, and suggests methods for correction and new designs for drainage improvement. The use of new concepts and designs should lead to the construction of more stable channels. (Wierswa-Purdue)

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF MODEL,

New Mexico Inst. of Mining and Technology, Socorro.

Nordic Hydrology, Vol 8, No 1, p 33-46, 1977. 6 tab, 9 fig, 11 ref.

Descriptors: *Parametric hydrology, *Runoff forecasting, *Surface runoff, Watersheds(Basins), Runoff, Model studies, Uniform flow, Topographic mapping, Agricultural watersheds, Rainfall, Hydrographs, Precipitation excess.

Identifiers: *Parameters, *Nonlinear surface runoff made Parameters, estimation Madesanah

Identifiers: *Parameters, *Nonlinear surface runoff model, Parameter estimation, Hydrograph prediction, Matrix.

The surface runoff madel, which was based on the concept of uniform nonlinearity, had three parameters. It was shown that the parameters can be estimated from information obtained from a topographic map of the watershed. Previously, the solution involved optimizing the model parameters over a set of rainfall-runoff events by a suitable algorithm in conjunction with an objective function. The optimized parameter values then were used in the model for prediction of surface runoff for rainfall events not used in the optimization. This method has serious limitations. An attempt was made to estimate the parameters of a uniformly nonlinear surface runoff model. An implicit assumption was that no changes take place in watershed physiography over the period in question. If changes do take place and are pronounced in scale, the determining equations have to be rederived. Also, the watersheds, grouped together, have to have similar geologic and physiographic features. The uniformly nonlinear model can be completely specified and is considered a promising tool in watershed hydrology. (Roberts-ISWS)

SHORT COURSE PROCEEDINGS - APPLICA-TIONS OF STORMWATER MANAGEMENT MODELS, 1976,

Massachusetts Univ. Amherst. For primary bibliographic entry see Field 6A. W77-12074

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY MANAGEMENT.

MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING, Slovenska Akademie Vied, Bratislava (Czechoslovakia).

For primary bibliographic entry see Field 4A. W77-12083

A SWAMPLAND MODEL,

Ministerio do Interior, Rio de Janeiro (Brazil). Departmento Nacional de Obras de Saneamento. O. Pfafstetter.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 476-482, 1974. 2 fig.

Descriptors: *Rivers, *Swamps, *Model studies, *Mathematical models, Wetlands, Rainfall, Precipitation(Atmospheric), Storage, Evaporation, Infiltration, Floods, Foreign countries, Channels, Foreign research, Backwater, Water balance, Discharge(Water), Hydrology. Identifiers: Brazil, *Paraguay River(Brazil).

A mathematical model for large rivers running through a very flat plain was described. Outstanding characteristics dealt with by the model were the very large overbank storage, pronounced backwater effect, important water losses by evaporation, infiltration on the flooded area, appreciable water gain from precipitation on the exposed water surfaces, and almost no runoff from the unflooded area. In order to reduce computer time for model runs, the selected river section was divided into only three reaches, and seven-day routing intervals were used. Special measures were conceived to prevent model instabilities related to large routing intervals and long river sections. (See also W77-06708) (Sims-ISWS) W77-12085

DETERMINATION OF INSTANTANEOUS UNIT HYDROGRAPHS BY LEAST SQUARES POLYNOMIALS,

Newcastle-upon-Tyne Univ. (England). Dept. of Civil Engineering. P. Johnson, and M. Clements.

P. Johnson, and M. Clements. In: Mathematical Models in Hydrology, Volume 2;

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, Jul 1971: International Association of Hydrological Sciences Publication No 101, p 483-492, 1974. 4 fig, 1 tab, 17 ref.

Descriptors: *Unit hydrographs, *Model studies, *Synthetic hydrology, *Least squares method, Watersheds(Basins), Hydrographs, Rainfall, Runoff, Streamflow, Simulation analysis, Mathematical studies, mathematical models, Regression analysis, Hydrology. Identifiers: *Polynomials.

After reviewing the dichotomy of approach used in deriving unit hydrographs, the theory of least squares polynomials and their application to the convolution integral was detailed. A method for deriving the instantaneous unit hydrograph using a least squares polynomial technique was outlined, and results of applying the method to three real flood events were discussed. (See also W77-06708) (Sims-ISWS)

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS, Indian Inst. of Tech., New Delhi. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 2A.
W77-12088

A MULTIPLE INPUT SYSTEM MODEL FOR THE HYDROLOGICAL BASIN,

Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A.

RAINFALL-DISCHARGE TRANSFORMATION RAINFALL-DISCHARGE TRANSFORMATION
MODELS MAY BE DIVIDED INTO TWO
CATAGORIES (LES MODELES DETERMINISTES DE TRANSFORMATION DES
PRECIPITATIONS EN DEBIT),

L'Enda et d'Applications

Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).

For primary bibliographic entry see Field 2A.

W77-12090

BEHAVIOUR AND PHYSICAL STABILITY OF SHEETFLOW IN SURFACE RUNOFF MODELS, Prague Agricultural Univ. (Czechoslavakia). Dept. of Water Resources.
V. Jelen, J. Nemec, and J. Zezulak.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 616-623, 1974. 3 fig, 4 ref.

Descriptors: *Surface runoff, *Sheet flow, *Model studies, Mathematical models, Simulated rainfall, Laboratory tests, Flow, Analytical techniques, Watersheds(Basins), Hydrodynamics, Computer models, Analog computers, hydrology.

Verification of mathematical simulation of surface runoff using a laboratory catchment model involves the measuring of sheetflow produced by a rain simulator on the model. The depth of sheetflow and its surface are subject to changes resulting from the possible wave regime of the flow. The conditions of formation, forms and parameters of the wave regime were ascertained numerically by analog computer, and its mathematical expression was discussed using the results of the numerical computation. (See also W77-06708) (Sims-ISWS) W77-12094

A MATHEMATICAL MODEL FOR FLOOD WAVE SIMULATION USING SYNTHETIC RAINFALL DATA FOR A VAST WATERSHED, Institute for Water Resources, Belgrade (Yugoslavia).
M. Brajkovic, S. Jovanovic, and R. Dakkak.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 624-633, 1974. 8 fig. 5 ref.

Descriptors: *Flood waves, *Floods, *Model studies, Mathematical models, Rainfall, Foreign countries, Runoff, Foreign research, Hydrographs, Watersheds(Basins), Simulation analysis, Discharge(Water), Rivers, Flood flow, Flood peak, Flood discharge, Hydrology.

Identifiers: *Zapadna Morava River(Yugoslavia), *Velika Morava River(Yugoslavia).

In this paper an approach for flood wave simulation over a vast catchment area was presented. The mathematical model of the Zapadna Morava River basin and rainfall-runoff relationships was verified using historical rainfall records and the corresponding observed hydrographs. To generate the flood waves at a number of control sections, 29 synthetic daily rainfall series for 22 rain gaging stations in the same watershed were used. From each rainy season, lasting from 1 March to 30 June, only one rainy spell was selected. Hence, 29 flood events were obtained by simulation which are supposed to have the highest peak discharges in the period considered (March-June). To test the results obtained, in this phase of study a frequency analysis of synthetic peak discharges was done, and the results were compared with frequency analysis of historical annual floods in V. Morava River basin. (See also W77-06708) (Sims-ISWS) W77-12095

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-

Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.

For primary bibliographic entry see Field 2A. W77-12096

NATURAL CATCHMENT REPRESENTATION BY A SERIES MODEL OF LINEAR CHANNELS-PART 2.

Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A.

W77-12097

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM.

Gatehouse Farm, Essex (England).

F. V. Appleby.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 667-687, 1974. 8 fig. 2 tab. 35 ref.

Descriptors: *Watersheds(Basins), *Hydrograph analysis, *Model studies, *Reviews, Streamflow, Rainfall-runoff relationships, Hydrographs, Hydrological systems, Baseflow, Surface runoff, Storm runoff, Theoretical analysis, Analytical techniques, Analysis, Mathematical models.

An outline presentation of a tentative general theory of streamflow runoff based on (1) the Horton-Zoch dichotomy for total runoff as a system of two independent states of flow, a 'baseflow' and a 'surfaceflow:' and (2) a generalization of the Dooge concept of a translation association for the subsystems. The complete mathematical model is a strongly nonlinear and compact system construction with scope for development. The system is self-adaptive and directly dependent on rainfield episode conditions. The mathematical theories of distributions, probability and parabolic systems are applicable disciplines. Parallels with molecular physics and biological associations were suggested. The theory was supported by hydrograph decompositions from a wide range of watershed conditions. (See also W77-06708) (Humphreys-W77-12099

PHYSICO-STATISTICAL MODEL OF RAIN-FALL FLOOD FORMATION AND DETER-MINATION OF ITS PARAMETERS, Hydrometeorological Service of the USSR, Moscow.

For primary bibliographic entry see Field 2A. W77-12100

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS, Univ. Urbana-Champaign. at

Hydrosystems Section. For primary bibliographic entry see Field 2A. W77-12107

SIMULATING OVERLAND FLOW ON HILL SLOPES WITH A KINEMATIC CASCADE, Agricultural Research Service, Beltsville, Md. Hydrography Lab. For primary bibliographic entry see Field 2A. W77-12108

A GENERALIZED STREAMFLOW SIMULA-TION SYSTEM,

National Weather Service, Sacramento, Calif. River Forecast Center. For primary bibliographic entry see Field 2A. W77-12113

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975, Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 7C. W77-12155

MAXIMUM FLOODFLOWS IN THE CONTER-MINOUS UNITED STATES, Geological Survey, Menlo Park, Calif. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-12156

2F. Groundwater

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,

Research Council of Alberta, Edmonton. O. Tokarsky. Report 76-2, 1977. 12 p, 1 map, 14 ref. \$2.00.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, Topography, Maps, Climatology, Precipitation(Atmospheric), Geology, Geologic formations, Wells, Water wells, Water levels, Aquifers, Sandstones, Springs, Water yield, Water resources, Water chemistry,

Dissolved solids. *Iosegun Lake Area(Alberta), *Alberta(Canada).

The Iosegun Lake area is covered only thinly by drift in the more rugged, hilly areas. The drift thickness may exceed 200 feet (60 m) in the area of Little Smoky River where thick buried valley sand forms an important aquifer from which yields in excess of 25 igpm (2 1/sec) are common. A continental sandstone-shale sequence, the Paskapoo Formation of Paleocene-Late Cretaceous age, underlies most of the southern and southwestern parts of the area and contains sandstone aquifers generally capable of producing upwards of 25 igpm (2 1/sec) to a single well. The Wapiti Foundation, a continental sequence of bentonitic and clayey sandstones of Late Cretaceous age, underlies the remainder of the area. Aquifers within the forma-tion generally are thin and discontinuous. Yields in a single well usually range from 5 to 25 igpm (0.4 to 2 1/sec). Sodium bicarbonate waters with total dissolved solids contents between 500 and 1500 ppm are the rule in the normally utilized aquifers, although wells completed in the Paskapoo Formation tend to have somewhat higher percentages of calcium and magnesium, and lower total dissolved solids contents. (Sims-ISWS) W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPITI AREA, ALBERTA, Research Council of Alberta, Edmonton.

R. Barnes.

Report 76-5, 1977. 36 p, 3 fig, 1 tab, 1 map, 23 ref, 1 append. \$2.00

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, *Rocky Mountain Region, Topography, Drainage, Maps, Climatology, Precipitation(Atmospheric), Runoff, Geology, Geologic formations, Wells, Water wells, Test wells, Aquifers, Springs, Water yield, Water chemistry, Dissolved solids, Water resources. Identifiers: *Mount Robson Area(Alberta), *Wapiti Area(Alberta), *Alberta(Canada).

Within the Rocky Mountain and Foothills. bedrock aquifers are characterized by fracture permeability and have structural rather than lithological boundaries. Flow systems are thought to be generally shallow and are bounded by major thrust fault zones which form highly permeable conduits for groundwater movement in both horizontal and vertical planes. Discharge from shallow bedrock aquifers is most abundant along

Group 2F-Groundwater

the fault zones, and flow rates increase with decreasing elevation from about 10 igpm to more than 1500 igpm (0.75 to 110 1/s). Northeast of the Rocky Mountains, the dissected Western Alberta High Plains are underlain by fractured sandstone and shale of the Paskapoo Formation. Fracture permeability leads to rapid transmission of groundwater, and water quality is excellent. The water table is often deep below the surface, and calcium-magnesium ion ratios range between 3 and 4. Northeast of the High Plain, natural discharge features are rare. Total dissolved solids contents of groundwater from shallow bedrock aquifers inase from less than 500 ppm on the northeast edge of the High Plain, natural discharge features are rare. Total dissolved solids contents of groundwater from shallow bedrock aquifers increase from less than 500 ppm on the northeast edge of the High Plains to highs of 2000 to 2500 ppm on the Wapiti Plain, and sodium and potassium gradually become the dominant cations. Yields range from 100 to 500 igpm (7.6 to 38 I/s) in alluvial outwash gravels of the Rocky Mountain Foothills and High Plains, and 1 to 25 igpm (0.076 to 1.9 1/s) in sandstone, shale, and coal aquifers of the Upper Cretaceous Wapiti Formation. Yields from Cretaceous bedrock aquifers of the Rocky Mountains generally are unpredictable, but carbonate rock types probably are the most highly yielding. (Sims-W77-11588

HYDROGEOLOGY OF THE WHITECOURT

AREA, ALBERTA, Research Council of Alberta, Edmonton. O. Tokarsky. Report 76-3, 1977. 12 p, 1 map, 10 ref. \$2.00.

Descriptors: *Hydrogeology, *Areal hydrogeology, *Groundwater, *Canada, Topography, Maps, Drainage, Climatology, Precipita-Drainage, Climatology, Precipita-tion(Atmospheric), Runoff, Geology, Geologic formations, Wells, Water wells, Water levels, Aquifers, Springs, Water yield, Water chemistry, Dissolved solids, Water resources.

Identifiers: *Whitecourt Area(Alberta),

*Alberta(Canada).

The Whitecourt map area is covered only thinly by a drift over most of the region northwest of the Athabasca River. The drift thickness may exceed 100 ft (30 m) in places in the southern, southeastern, and eastern parts of the area in buried valleys. Sand and sand and gravel within the valleys form important aquifers which may yield upwards of 25 igpm (about 2 1/sec) to a single well. Two forma-tions, both continental shale-sand sequences (the Paskapoo Formation of Paleocene-Late Cretaceous age and the Wapiti Formation of Late Cretaceous age) underlie most of the area. Single well yields from aquifers within the formations generally range from 5 to 25 igpm (0.4 to 2 1/sec), although areas of both higher and lower produc-tion are to be found. Sodium bicarbonate waters with total dissolved solids contents from 500 to 2000 ppm are the rule within commonly utilized rs at depths of less than 500 ft (150 m). The total dissolved solids contents are lowest in wells in the areas with more rugged topography, and highest in the area of low relief. (Sims-ISWS) W77-11589

A METHOD OF CALCULATING THE HYDRAULIC PROPERTIES OF LEAKY AQUIFER SYSTEMS, VIAK A. B., Falun (Sweden).

G. Gustafson. Nordic Hydrology, Vol. 8, No. 2, p 65-82, 1977. 14 fig, 2 tab, 4 ref, 2 append.

Descriptors: *Aquifer testing, *Hydraulic proper-ties, *Artesian aquifers, *Leakage, *Glacial aquifers, Pumping, Drawdowns, Storage coeffi-cient, Permeability, Transmissivity, Graphical analysis, Aquicludes, Groundwater movement, Observation wells, Boundaries(Surfaces), Drains,

On-site tests, Analytical techniques, Curves, Foreign research.

Identifiers: *Eskers, *Leakage factor, *Sweden, Image wells, Barrier boundaries, Drain function, Channel aquifers, Type curves.

The paper described a method for calculating the hydraulic properties of esker aquifers where a leakage to the aquifer is induced by pumping. The method is an extension of the channel method described in an earlier paper. As an example of the applicability of the method, a short description of a performed pump-test was given. (Visocky-ISWS)

FLUCTUATIONS IN THE WATERLEVEL IN WELLS DUE TO VARIATIONS IN ATMOSPHERIC PRESSURE,

TERRAQUA ApS, Kalundborg (Denmark). For primary bibliographic entry see Field 4B. W77-11606

ESTIMATION OF TRANSMISSIVITY AND PERMEABILITY IN SWEDISH BEDROCK, Chalmers Univ. of Technology, Goteborg

L. Carlsson, and A. Carlstedt. Nordie Hydrology, Vol. 8, No. 2, p 103-116, 1977. 8 fig, 3 tab, 14 ref.

Descriptors: *Transmissivity, *Europe, *Bedrock, *Permeability, Pump testing, Groundwater, Water yield, Specific yield, Drawdown, Hydrology, Foreign research, Foreign countries, Groundwater resources, *Estimating. Identifiers: *Groundwater evaluation, *Sweden.

Statistical analysis of pumping-test data from wells was used to calculate average values of transmissivity and permeability in different Swedish rocks. The influence of the well-loss on the calculations was discussed. The highest values of transmissivity and permeability of the investigated rocks were found in the sandstones of Algonkian and Cambrian age. The Archean crystalline rocks show a wide range of results, and of the investigated rocks, the gneisses seem to be more permeable than the granites. However, the degree of tectonization affects the hydraulic proerties of the rocks considerably. (Lee-ISWS)

SOIL WATER MODELING II: ON SENSITIVITY TO FINITE DIFFERENCE GRID SPACING, Agricultural Research Service, Columbia, Mo. For primary bibliographic entry see Field 2G.

HOT GROUNDWATER SYSTEMS IN ICELAND TRACED BY DEUTERIUM, Iceland Univ., Reykjavik. Science Inst.

B. Arnason. Nordic Hydrology, Vol 8, No 2, p 93-102, 1977. 3 fig. 21 ref.

Descriptors: *Groundwater, *Geothermal studies, *Thermal water, *Deuterium, On-site investigations, Surveys, Foreign countries, Tracers, Foreign research, Oxygen, Stable isotopes, Foreign research, Oxygen, Stable isotopes, Isotopes, Isotopes, Isotopes studies, Recharge, Wells, Springs, Thermal springs, Precipitation(Atmospheric), Groundwater movement, Hydrology.

Identifiers: *Iceland.

Deuterium and oxygen-18 were used as natural tracers for hydrothermal systems in Iceland, and results were summarized. The deuterium content of a single sample of a local cold spring or river, except those rivers fed by considerable amount of glacier melt water, can be used to estimate the mean deuterium concentration of precipitation in the corresponding locality. Furthermore, the deu-terium content of the last winter layer, collected

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on Icelandic glaciers in spring before the melting season, is practically identical to the mean value of the corresponding annual precipitation. These facts were used to draw a detailed map showing the amount of deuterium in precipitation over the whole country. Deep ice core studies showed that the deuterium content of precipitation in each place has remained more or less unchanged during the last 8000 years. Measurements of both deuterium and oxygen-18 in the groundwater have con-firmed that all groundwater in Iceland is originally meteoric, and that the deuterium content of the thermal water does not change on its way through the bedrock. The deuterium content of water discharging from hot springs or drill holes is often very different from the deuterium content of local precipitation. On the other hand, by comparing results obtained with the deuterium map, it is often possible to find where the water has fallen as rain and to trace its underground flow path. Deuterium measurements were made on water from nearly all eothermal areas in the country. (Sims-ISWS) W77-11812

TERRAQUA Aps, Kalundborg (Denmark).
T. Sorensen, and H. O. Hansen.
Nordic Hydrology, Vol 8, No 2, p 117-128, 1977. 7

*Europe, Descriptors: *Aquifer systems, *Hydrogeology, Hydraulic properties, *On-site inryunogeology, ryunamic properties, Orsiste vestigations, Mathematical models, Pumping, Geologic mapping, Sedimentary rocks, Borehole geophysics, Logging(Recording), Planning, Groundwater recharge, Observation wells, Drawdown, Graphical analysis, Leakage, Transmissivity, Storage coefficient, Tritium, Resistivity, Porosity, Foreign research, Foreign countries. Identifiers: *Denmark, *Bornholm(Denmark).

Problems and procedures concerning planning and execution of geohydrological investigations of aquifer systems composed of consolidated sedi-mentary rocks were discussed. The discussion was illustrated by investigations in an area on the island of Bornholm, Denmark, where the aquifer system is composed of inclined and faulted beds of system is composed of inclined and faulted beds of sand, silt- and claystone. The investigations included the following elements: (1) Hydrogeological mapping; (2) geophysical investigations and well-logging (gamma-, resistivity-, flow- and conductivity-log); (3) Pumping-test, evaluation of hydraulic properties of the aquifers, construction of mathematical model; and (4) delineation of infiltration areas and evaluation of potential infiltratration areas and evaluation of potential infiltra-tion, protection against groundwater pollution. The paper emphasized the general procedure for engineering geohydrological investigations of con-solidated sedimentary rocks and the correlation of the information collected by different methods. (Visocky-ISWS) W77-11813

RELATIONSHIP OF TECTONIC STRUCTURE TO AQUIFER MECHANICS IN THE WESTERN GRAND CANYON DISTRICT, ARIZONA, Wyoming Univ., Laramie. Dept. of Geology. P. W. Huntoon.

Available from the National Technical Informa-Avanable from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 308, Price codes: A05 in paper copy, A01 in microfiche. Wyoming, Water Resources Research Institute, Laramie, Water Resources Series No. 66, April 1977. 51 p, 8 fig. 4 tab, 40 ref. OWRT B-031-WYO(1), 14-34-0001-6134.

*Groundwater *Groundwater potential, *Groundwater recharge, *Aquifer characteristics, *Arizona, Permeability, Limestone, Carbonate rocks. Identifiers: *Groundwater prospecting, *Grand Canyon district(Ariz).

Groundwater-Group 2F

The Rampart Cave Member of the Muav Limestone is the major aquifer in the western Grand Canyon district based on spring locations in the walls of the Grand Canyon. Permeabilities of the Paleozoic rocks are locally enhanced by fault-ing. Caves are not associated with springs in the area. Most of the waters discharging from the carbonate rocks are of the calcium-magnium-bicarbonate type; total dissolved solids range between 272 and 810 mg/1, temperatures range between 69 and 80F, and discharges range up to about 7 cu ft/sec. Minimum recharge rates are on the order of 0.1 in/yr. Total spring and seep discharge is approximately 20 cu ft/sec. Prospects for developing large ground water supplies in the district are dim because the total recharge is small, permeabilities are small, and there are no extensive permeable zones under the plateaus in which large quantities of water are in storage. Selected fault zones that supply water to large springs offer the most promising areas for drilling. Drill sites should be located on the downthrown block along the fault and the hole should penetrate to the bottom of the Rampart Cave Member. Minimum drilling depths along promising faults in the area are 1900 ft. Prospects for ground water development from the Paleozoic rocks in the Shivwits plateau are vir-tually nonexistent because the rocks in the region appear to be essentially dry, even along permeable W77-11867

MOVEMENT OF MOISTURE IN THE UNSATURATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,

Geological Survey, Mineola, N.Y. Water Resources Div. For primary bibliographic entry see Field 4B. W77-11872

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES-GREAT BASIN REGION,

Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water Resources Div.

For primary bibliographic entry see Field 4B. W77-11873

DIGITAL MODEL ANALYSIS OF THE PRIN-CIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA,

Survey, Doraville, Ga. Water Geological Resources Div. For primary bibliographic entry see Field 7C. W77-11879

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH, Indian Inst. of Tech., Kanpur. Dept. of Chemistry.

For primary bibliographic entry see Field 4B.

A DISCRIMINANT FUNCTION FOR GROUND WATER EXPLORATION.

Univ., Dallas, Southern Methodist D. J. Jin.

Texas Journal of Science, Vol 27, No 1, March, 1976, p 87-94, 2 tab, 1 ref.

Descriptors: *Groundwater, *Groundwater poten-tial, *Aquifer characteristics, *Permeability, *Porosity, *Aquifers, *Aquifer testing, Ground-water movement, Groundwater resources, Surface-groundwater relationships, Exploration, Evaluation, Locating, Water sources, Mathematical studies Identifiers: Grain size, Discriminant function.

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A function expressing the relationship of an aquifer's grain size, porosity, and permeability is established for use as a standard in determining the suitability of an area for ground water development. Data used in establishing the function were collected from aquifers already proven to be suita-ble or not suitable for ground water development. Results support both the discriminant function as a powerful analytical tool for ground water exploration and the choice of grain size, porosity, and permeability as good discriminatory variables. (Ullery-Arizona) W77-12003

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL. Institut fuer Wasserwirtschaft, Berlin (East Ger-

many).

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 608-615, 1974. 5

Descriptors: *Subsurface drainage, *Groundwater movement, *Groundwater recharge, *Model stu-dies, Soil water, Infiltration, Groundwater, Evapotranspiration, Rainfall Snowmelt Precipitation(Atmospheric), Moisture content, Root zone, Mathematical models, Recharge, Hydrology Identifiers: *Gravity drainage.

The increasing demands on water resources as a result of the rapid industrial development in the German Democratic Republic require a detailed research of the water balance components. Knowledge of the annual course of natural groundwater recharge is an essential prerequisite towards optimal withdrawal policy for groundwater systems. Starting from the diffusion equation for water movement in unsaturated soils, a simple mathematical multi-layer model was developed to calculate vertical water movement in the unsaturated soil. The multi-layer model allows the computation of gravity drainage and water content of the soil continuously, depending on such primary factors as precipitation, evapotranspiration, and soil retention. The mathematical multi-layer model is suitable for calculating the annual course of natural groundwater recharge for areas without capillary rise of water from the roundwater level into the root zone. The testing of the multi-layer model was carried out with mea sured data from weighing lysimeters. (See also W77-06708) (Sims-ISWS) W77-12093

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE OPERA-TION OF INFILTRATION WATER INTAKE,

All-Union Scientific Research Hydrogeology and Engineering Geology, Moscow

I. I. Krashin, and D. I. Peresunjko

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 815-820, 1974. 3

Descriptors: *Model studies, *Groundwater recharge, "Aquifer characteristics, "Hydrogeology, Analog models, Simulation analysis, Alluvial aquifers, Seepage, Infiltration, Rivers, Floods, Mathematical models, Water Rivers, Floods, Mathematical moders, was yield, Well spacing, Foreign research, Foreign Identifiers: *USSR, *Sergi river valley(Ural).

The process of periodical drainage in the dry weather period and alluvial aquifer replenishment due to infiltration in the flood period was simulated on an analog computer USM-1 (RC-network) for the Sergi river valley (Ural). The infiltration yield is just twice the dry weather flow of the river. The model takes account of water-bearing rocks of double-layer structure, anisotropy of the seepage coefficient of alluvium in plan and section, and the ratio of groundwater and river water which varies in annual and perennial cycles. The modelling showed that groundwater resources are formed due to seepage from the river and periodi-cal drainage of alluvial storage. The modelling also showed that the previously designed pattern of locating wells of a water intake must be changed. The disadvantage of the design pattern is that a large part of the water intake is located in an area of insufficient alluvial regulating storage, which results in a sharp drawdown in these wells' levels and is accompanied by the complete drainage of individual large blocks of alluvium. The optimum pattern of locating wells of the water intake was selected with the aid of the model. (See also W77-06708) (Humphreys-ISWS)

GROUNDWATER CHEMISTRY AND THE TRANSPORT EQUATIONS, Princeton Univ., N.J. Water Resources Program

G. F. Pinder, and J. D. Bredshoeft.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 831-837, 1974. 9

Descriptors: *Groundwater movement, *Finite element analysis, *Model studies, *Numerical analysis, Mathematical models, Chemical reactions, Groundwater, Convection, Equations, Porous media, Open channel flow, Flow, Hydrologic aspects, Hydrologic systems, Base flow, Surface water, Surface-groundwater relationships, Simulation analysis, *Geochemistry.

Continuum theory was used as a frame of reference in which to view efforts to apply numeri-cal methods to hydrological problems. In order to manage effectively groundwater developments, it is necessary to predict the response of groundwater systems to various hydrological stresses. To predict the response generally requires simulation of the field problem through the use of a deterministic model. In the most general case, the complete physical-chemical description of moving groundwater must include chemical reactions in a multicomponent fluid and requires the simultaneous solution of the differential equations that describe the transport of mass, momentum, and energy in porous media. The difficulties encountered in solving this set of equations for real problems have forced hydrologists to consider simplified subsets of the general problem. The equation of motion for single component ground-water flow, which describes the rate of propagation of a pressure change in an aquifer, has been solved for many different initial and boundary conditions. In order to describe the transport of miscible fluids of different density, such as salt water and freshwater, the mass transport equation and the equation of motion were coupled and were solved numerically. Numerical solutions also were obtained for the heat transport equation and the equation of motion, particularly for convection problems. The challenging problem for the future is the simultaneous solution of the mass, momentum and energy equations for porous flow and simulation of the complete groundwater system. (See also W77-06708) (Humphreys-ISWS) W77-12112

SENSITIVITY ANALYSIS IN AQUIFER STU-

Stanford Univ., Calif. School of Earth Sciences. For primary bibliographic entry see Field 4B. W77-12160

Group 2G-Water In Soils

2G. Water In Soils

SOIL AERATION, NITRATE REDUCTION AND EL CODING TOLERANCE IN HIGHER

PLANTS, Seville Univ. (Spain). Dept. of Ecology. For primary bibliographic entry see Field 3C.

THE DEPTH OF PENETRATION WITH WATER OF THE PESTICIDE BHC IN THE PRESENCE OF SULFANOL INTO THE GROUND, (IN RUS-

Nauchno-Issledovatelskii Institut Epidemiologii, Mikriobiologii i Gigieny, Vilnius (USSR). For primary bibliographic entry see Field 5B. W77-11523

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS,

Delaware Univ., Newark. For primary bibliographic entry see Field 5B. W77-11524

ORGANIC MATTER AND PARATHICN DEGRADATION IN FLOODED SOIL, Central Rice Research Inst., Cutrack (India) For primary bibliographic entry see Field 5B. W77-11561

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY. Soils and Irrigation Research Inst., Potchefstroom (South Africa)

For primary bibliographic entry see Field 3F. W77-11580

EVALUATION OF THEORETICALLY PRE-DICTED THERMAL CONDUCTIVITIES OF SOILS UNDER FIELD AND LABORATORY

CONDITIONS, Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soil and Water.

A. Hadas.

Soil Science Society of America Journal, Vol. 41, No. 3, p 460-466, May-June 1977. 7 fig, 18 ref.

Descriptors: *Soil water movement, transfer, *Water vapor, Soil moisture, Soil water, Soil temperature, Irrigation, Irrigation effects, Thermal conductivity, Model studies, On-site in-vestigations, Laboratory tests, Soil physics, Agriculture, Soil science. Identifiers: Vapor movement.

In the literature one finds claims that the PhilipdeVries model of heat and moisture transfer fails to predict the amounts of water moved by vapor transfer. In the work reported here, an attempt was made to check and to verify the predictive capabilities of the deVries, Philip and deVries models for vapor transfer by evaluating the latent heat transfer carried by vapor rather than to ac-count for vapor flow from the usually performed total moisture balance. It was found that the deVries model predicts accurately the transfer of heat by vapor under steady-state conditions, but the model underestimates transfer of heat under nonsteady-state conditions. The possibility that the assumed diffusive vapor transport should be corrected by including 'enhancement factors' so as to incorporate local thermal gradients and mass movement induced vapor transfer, not accounted by the present model, was brought up; and the nature of the enhancement factors and the implications to field conditions were discussed. (Sims-ISWS) W77-11611

EVALUATING WEATHERING CHARAC-TERISTICS OF WATER-HARVESTING CATCHMENTS FROM RAINFALL-RUNOFF ANALYSES, Agricultural Research Service, Phoenix, Ariz.

Water Conservation Lab. For primary bibliographic entry see Field 3B.

A METHOD FOR THE SIMULTANEOUS CON-TROL OF THE WATER REGIME AND GASE-OUS ATMOSPHERE IN SOIL COLUMNS.

Utah State Univ., Logan. Dept. of Soil Science R. J. Wagenet, and J. L. Starr. Soil Science Society of America Journal, Vol 41, No 3, p 658-659, May-June 1977. 1 fig, 4 ref.

Descriptors: "Soil water, "Leaching, "Soil gases, Equipment, Laboratory tests, Laboratory equipment, Nitrogen, Water chemistry, Soil water movement, Soil physics, Soil science. Identifiers: "Soil columns.

A technique which is useful in laboratory soil columns was described. The technique allows control of soil water content, regulation of the average composition of the soil atmosphere, and collection of leachate in variable increments. The design and construction of the system, as well as its advantages and disadvantages, were explained in detail, and references were made to the adaptability of the technique to studies involving N transort and transformation, microbial populations, salinity, reduction-oxidation reactions, or soil gas sampling. (Sims-ISWS) W77-11614

A MODIFIED MERCURY TENSIOMETER,

Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development. L. Savvides, R. S. Ayers, and M. Ashkar Soil Science Society of America Journal, Vol 41, No 3, p 660-661, May-June 1977. 1 fig.

Descriptors: *Tensiometers, *Equipment, *Soil water, Manometers, Foreign research, Mercury, Instrumentation, Tension, Moisture tension, Onsite investigations, Irrigation, Moisture content, Agriculture, Soil science.

Identifiers: *Cyprus, Mercury tensiometers, Moisture-measuring equipment.

A modified type of Hg tensiometer was introduced. The manometer in the tensiometer uses the usual principal as other Hg manometers use. However, the main difference in the modified tensiometer is that the Hg manometer is contained within the tensiometer body itself. A relatively small volume of Hg is used, and the small mercury reservoir can be filled or emptied rather easily. Once the reservoir is filled, the mercury usually can be safely left for the lifetime of the tensiometer. Tensiometers of the proposed design have been handled successfully for scheduling irrigation on shallow soils by unskilled farmers in Cyprus for the last 4 years. (Sims-ISWS) W77-11615

AN ULTRASONIC NEBULIZATION TECHNIQUE FOR ADDING AQUEOUS SOLUTIONS UNIFORMLY TO DRY SOILS, Montana State Univ., Bozeman. Dept. of Chemis-

A. Mubarak, R. Woodriff, and R. A. Olsen. Soil Science Society of America Journal, Vol 41, No 3, p 661-662, May - June 1977. 2 fig, 2 tab, 4 ref.

Descriptors: *Soil moisture, *Laboratory equipment, *Wetting, Aqueous solutions, Electrolytes, Soil water, Laboratory tests, Equipment, Water vapor, Moisture content, Aerosols, Soils, Soil tests, Soil physics, Soil science. Identifiers: Nebulizers.

An ultrasonic nebulizer was utilized successfully to provide a relatively convenient laboratory means for wetting dry soil with aqueous solutions to any selected moisture or electrolyte content. The technique is believed to cause a minimum of alteration of the chemical and physical properties of the sample and causes aqueous solutions to become very uniformly distributed throughout all accessible zones. (Sims-ISWS) W77-11616

WATER INTAKE BY A WATER-FILLED PLEX-

IGLAS PERMEAMETER CELL, Purdue Univ., Lafayette, Ind. Dept. of Agronomy. G. Y. Tsuji, and D. Swartzendruber. Soil Science Society of America Journal, Vol 41, No 3, p 662-664, May-June 1977. 2 fig, 4 ref.

Descriptors: *Permeameters, *Laboratory equipment, *Plastics, Soil tests, Permeability, Equip-ment, Instrumentation, Absorption, Water loss, Laboratory tests, Soil science. Identifiers: *Acrylic plastic, Plexiglas, Water ab-

sorption by plastic.

Water entry into a Plexiglas (acrylic plastic) per-meameter cell was measured by the recession of water in capillary standpipes connected to the water-filled cell. Submergence of the permeameter in water demonstrated that the water entry was not caused primarily by a slight leak in the permeame-ter or by water vapor diffusion through its walls. Also, the rate essentially was unaffected when the permeameter contained a water-saturated mixture of sand, silt, and bentonite. Calculations for the permeameter in air indicated the observed intake rate to be 20 times that attributable to water vapor diffusion through the Plexiglas walls, and 1/8 that attributable to direct water absorption as obtained from a maximal handbook value. Hence, it appears that direct absorption by the Plexiglas is the likely cause of water entry into the permeameter. (Sims-ISWS)
W77-11617

CYANIDE MOBILITY IN SOILS, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

For primary bibliographic entry see Field 5B. W77-11619

THE EFFECT OF SALINITY OF QARUN LAKE ON THE ADJACENT SOIL, Ministry of Agriculture, Cairo (Egypt). Soils and

Water Research Inst. For primary bibliographic entry see Field 2H. W77-11625

SOME CHARACTERISTICS OF SOIL CRUSTS

IN CALCAREOUS SOIL,
Ministry of Agriculture, Cairo (Egypt). Soils and
Water Research Inst.

Sh. Milad, and M. El Hakim. Agricultural Research Review (Cairo), Vol 54, No 4, April, 1976. p 75-79, 3 tab, 7 ref.

Descriptors: *Calcareous soils, *Soil-water-plant Descriptors: "Calcareous soils, "Soil-water-piant relationships, "Drying, "Soil properties, "Calcium carbonate, "Soil surfaces, Deserts, Arid lands, Agriculture, Crop production, Permeability, Root development, Soil texture, Particle size.

Identifiers: "Soil crusts, Seedlings, Root hairs,

The harmful effects upon seedlings of soil crusting in calcareous soils severely limits potential crop production. To help find appropriate methods of reclamation, a study of some characteristics of soil crusting was carried out. Composite samples of crusted surface calcareous soils and adjacent depths were collected from an uncultivated area near Alexandria, Egypt and analyzed. Chemical analysis of water extracts from both samples revealed low salt contents suggesting granulomet-

ric size distribution as an explanation of crust forric size distribution as an explanation of crust for-mation. A wide difference in fine particle content was found to exist between the two samples, sug-gesting great significance in regard to their relative permeability and plasticity. The high plasticity and low permeability of the crust sample relative to the underlying sample results in vertically and horizontally cracked crust upon drying, thus explaining the damaging effect of soil crust upon seedling root hairs. Furthermore, the low permea-bility of the crust renders irrigation difficult. Crusts may also interfere with O2 and CO2 interchange between soil and atmosphere. (Ullery-W77-11626

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND

SOIL SALINITY,
Ministry of Agriculture, Cairo (Egypt). Soils and
Water Research Inst.

For primary bibliographic entry see Field 4B. W77-11627

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION,

Central Arid Zone Research Inst., Jophpur (India). For primary bibliographic entry see Field 4D.

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

For primary bibliographic entry see Field 2I.

EFFECTS OF SODIUM SULFATE AND SODIUM CARBONATE SOLUTIONS ON CHEMICAL AND PHYSICAL PROPERTIES OF A CHER-

NOZEM SOIL,
Department of Agriculture, Vegreville (Alberta).
Solonetzic Soil Sub-Station.

For primary bibliographic entry see Field 2K. W77-11650

DISTRIBUTION OF NITRIFYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS, For primary bibliographic entry see Field 5C. W77-11651

WATER STATUS AND DISTRIBUTION OF CYANIDIUM CALDERIUM IN SOIL, California Univ., Los Angeles. Dept. of Bac-

teriology. D. W. Smith, and T. D. Brock. J Phycol. 9(3), p 330-332, 1973.

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Descriptors: *Soil algae, *Distribution, Mosses, *Photosynthesis, Soils, Soil water, Lichens. Identifiers: *Cyanidium-Caldarium.

The size and photosynthetic ability of C. caldarium populations in soil were related to the water status of soil, wetter soil areas having larger popu lations and more extensive photosynthesis. The application of the direct methods used to the study of other soil algae, mosses, and lichens is discussed.—Copyright 1974, Biological Abstracts, W77-11788

SOIL WATER MODELING II: ON SENSITIVITY TO FINITE DIFFERENCE GRID SPACING, Agricultural Research Service, Columbia, Mo. C. R. Amerman, and E. J. Monke.

Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 478-484, 488, May-June 1977. 10 fig, 2 tab, 18 ref.

Descriptors: *Soil water, *Soil water movement, *Model studies, *Mathematical models, Infiltra-tion, Finite element analysis, Analytical techniques, Mathematics, Water levels, Flow, Hydraulic conductivity, Saturated flow, Unsaturated flow, Hydrology.
Identifiers: *Grid size effects, Grid spacing, Identifiers: Model grids.

The influence of finite difference grid size on soil the influence of time difference gnd size on sou water flow model accuracy was studied using two cases. One case was of steady, two-dimensional infiltration using the successive overrelaxation (SOR) method of solving finite difference equations. The other case was of transient, two-dimensional infiltration using the alternating direction implicit (ADI) method. Finite difference expressions were formulated for both cases using central differencing techniques. In the transient case, a very small grid size in both time and space dimensions was necessary at the initiation of infiltration. Furthermore, the ADI method for the nonlin case was only conditionally stable-at least at the initiation of infiltration. As infiltration proceeded, however, both the time and the space grid sizes could be made larger. Indicators of a grid size that was obviously too coarse were a fluctuating infiltration rate in the transient case and irregulary shaped equipotential lines in the steady-state case. Although the models were nonlinear, they both converged; i.e., successively smaller grid sizes yielded solutions that asymptotically approached a limit. For a given regular grid size, considerable computational saving could be effected without appreciable loss of accuracy by using an irregular grid in which the regular grid size was duplicated grid in which the regular grid size was unpresent in the part of the section exhibiting the greatest curvature of equipotential lines, while larger grid sizes could be used in other parts of the section. Smaller grid sizes also were needed in regions smaller grid sizes also were necessary large, where hydraulic gradient changed rapidly. Accuracy of estimation varied approximately with the inverse of grid size rather than with the square of the inverse, as is generally claimed for central dif-ferencing on a square grid. (See also W76-10933) (Sims-ISWS)

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD

Ohio State Univ., Columbus. Dept. of Agronomy. For primary bibliographic entry see Field 2J. W77-11797

OPTIMAL PREDICTION OF PONDING, Agricultural Research Service, Fort Collins,

R. E. Smith, and J. Y. Parlange. Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 493-496, May-

June 1977. 1 tab, 6 ref, 1 append

Descriptors: *Ponding, *Runoff, *Rainfall, *Model studies, Mathematical models, Soil physics, Porous media, *Filtration, Precipitation(Atmospheric), Hydraulic conductivity, Moisture content, Saturated soils, Surface runoff, Soil science, Watersheds(Basins).

Soil physics and porous media flow are being used more and more today to develop means to predict hydrologic response of watersheds and to provide better management tools for water resources. One important variable in studying watershed response to storm rainfall is the time between initiation of rainfall and the initiation of surface runoff, or ponding time. This study described a mathematical technique that allows improved estimates of the delay in watershed response to rain, knowing only two basic soil parameters from the physics of soil water flow. (Sims-ISWS) W77-11798

COMPREHENSIVE GEOHYDROLOGICAL STUDY OF CONSOLIDATED SEDIMENTARY ROCKS IN BORNHOLM, TERRAQUA ApS, Kalundborg (Denmark). For primary bibliographic entry see Field 2F. W77-11813

HEAT AND VAPOR MOVEMENT DURING IN-FILTRATION INTO DRY SOILS, Illinois Univ. at Urbana-Champaign. Dept. of

Agronomy.
E. R. Perrier, and O. Prakash.
Soil Science, Vol 124, No 2, p 73-76, August 1977.

Descriptors: *Infiltration, *Water vapor, *Temperature, Humidity, Moisture, Soil moisture, Sorption, Heat, Soils, Soil water, Soil water movement, Evaporation, Thermal conductivity, Laboratory tests, Soil science. Identifiers: Wetting fronts, *Dry soils.

Temperature and relative humidity were monitored in a horizontal column apparatus at selected sites during infiltration into dry soil. As the wetting front approached a measurement site, the temperature was observed to rise; later the humidity was observed to increase, which was followed very closely by the wetting front. As the liquid front passed the measurement site, the tempera-ture was observed to drop rapidly. The data showed that the advance of a wetting front involves several processes: (1) as dry soil is wetted, a large amount of heat is evolved; (2) evaporation during the wetting process supplies a vapor phase; (3) as liquid moves into dry soil, the vapor phase moves as a front immediately ahead of the wetting front; (4) a large portion of the heat evolved moves as a front well in advance of both the vapor and liquid fronts; and (5) the heat evolved sub-sequently heats the liquid front; however, due to evaporation and the thermal conductivity of er, the wetted soil behind the liquid front is cooled. (Sims-ISWS)

PERCOLATION THEORY OF RESIDUAL PHASES IN POROUS MEDIA,

Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Sceince. R. G. Larson, L. E. Scriven, and H. T. Davis. Nature, Vol. 268, No. 5619, p 409-413, August 4, 1977. 6 fig. 17 ref.

Descriptors: *Percolation, *Porous media, *Model studies, Mathematical models, Laboratory tests, Soil water movement, Wetting, Percolating water, Soil water, Fluid mechanics, Flow, Groundwater. Identifiers: *Percolation theory, Residual phases.

When one fluid displaces another by flow through a porous medium, the fraction of pore space occua potous meaning, the traction to pote space over pied by trapped residual phase correlates with the ratio of viscous to capillary forces in the flow. This dependence, heretofore unexplained, is derived from the mechanics of fluid blobs, the nature of pore sturcture, and percolation theory. Pore space topology was shown to be as important as geometry in the statistical flow behavior of large populations of fluid blobs in two-phase flow in porous media. Topology and geometry each can be modelled usefully by a single parameter charac-teristic of the pore space. (Sims-ISWS)

DIURNAL SOIL WATER REGIME IN THE TILLED PLOW LAYER OF A WARM, HUMID

CLIMATE, Southern Piedmont Conservation Research Center, Watkinsville, Ga.

R. R. Bruce, A. W. Thomas, L. A. Harper, and R. Soil Science Society of America Journal, Vol 41,

No 3, p 455-460, May-June 1977. 12 fig, 1 tab, 14

Group 2G-Water In Soils

Descriptors: *Soil water, *Diurnal, *Cultivation, *Humid climates, Depth, Soil temperature, Air temperature, Wind velocity, Vapor pressure, Water vapor, On-site investigations, Humid areas. Identifiers: Plow layer.

The soil water content in 10 depth intervals in the surface 15 cm of soil was determined hourly for 9 days in June at 83 deg 25 min W, 33 deg 52 min N. Over the same period at 15-min intervals, soil temperatures were measured at eight depths, windspeed and air temperatures at six elevations, atmospheric water vapor pressures at three eleva-tions, incident solar and net radiation at one meter. From the microclimate data, flux of water vapor at the soil surface was calculated, which was then used to compute soil water flux at several depths by using soil water content data. The diurnal soil water content and soil water flux patterns were compared for a dry period before a rainfall event and afterward. Dramatic diurnal variation of the soil water content at depths less than 2 cm was observed. The variation during periods of no rain is related to daily radiation inputs at the soil surface, which generated the observed temperature and soil water gradients responsible for soil water redistribution. Occurrence of rainfall and infiltration events during the measurement period showed additional dynamics of the field system. Descriptions of the diurnal soil water dynamics in the plow-layer provide a basis for examining soil processes dependent upon soil water regime. (Visocky-ISWS) W77-11826

OBSERVATIONS ON ALGAE OF SOME ARID AND SEMI-ARID SOILS OF RAJASTHAN, Wilson Coll., Bombay (India). Dept. of Biology. Y. S. Anantani, and K. V. Marathe. J Univ. Bombay. 41(68), p 88-91, 1972.

Descriptors: Algae, *Soil algae, *Soil moisture, *Moisture content, Climates, Salts, *Arid lands. Identifiers: Rajasthan(India).

The soils of Rajasthan, India, have very poor algal flora. This is due to harsh climatic conditions, low soil moisture content and large quantities of dissolved salts.—Copyright 1974, Biological Abstracts, Inc. W77-11869

MOVEMENT OF MOISTURE IN THE UNSATURATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,

Geological Survey, Mineola, N.Y. Water Resources Div. For primary bibliographic entry see Field 4B. W77-11872

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH,

For primary bibliographic entry see Field 4B.
W77-11932

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT - PHASE III.

Washington Univ., Seattle, Coll. of Forestry. For primary bibliographic entry see Field 4C. W77-11941

EFFECT OF SOIL MOISTURE TENSION AND AMENDMENTS ON VIELDS AND ON HERBAGE N, P, AND S CONCENTRATIONS OF ALFALFA.

Department of Agriculture, Saskatoon (Saskatchewan). For primary bibliographic entry see Field 3F. W77-11942 RELATIONSHIP BETWEEN POTATO YIELD AND OXYGEN DIFFUSION RATE OF SUBSOIL, Department of Agriculture, Frederiction (New Brunswick). Research Station. For primary bibliographic entry see Field 3F. W77-11963

ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS, Ontario Dept. of Agriculture and Food, Toronto. Dept. of Land Resource Science. For primary bibliographic entry see Field 5B. W77-11967

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND,
Agricultural Research Service, Lincoln, Nebr.

Agricultural Research Service, Lincoln, Nebr. North Central Region. For primary bibliographic entry see Field 5C. W77-11976

USING LIQUID POULTRY WASTES IN WOODLANDS,
Connecticut Agricultural Experiment Station New

Haven.
For primary bibliographic entry see Field 5E.
W77-11979

DATA CONCERNING THE NATURAL CONDITIONS AND THE SOIL OF DABULENIPOTELU-CORABIA STATION FOR IMPROVEMENT OF SOIL WATER RESOURCES, Institutul de Studii si Ceretari Pedologie, Bucharest (Rumania).

M. Parichi, T. Trandafirescu, S. Nastea, and G. Dragomir.
An Inst Stud Cercet Pedol. 39, p 313-320, 1971(1972)

Descriptors: *Soil water, *Drainage, *Dunes, Soils, *Sands, Clays, Loams, Humus, *Wind erosion.

dentifiers: *Dabuleni-Potelu-Corabia Station(Romania).

The Dabuleni-Potelu-Corabia Station (Romania) for improvement of water resources is located on the left side of the Danube river in the territory of Potelu lacustrine complex. Due to the natural conditions (relief, climate, ground water, parent material), slightly developed soils, including floodplain soils occur. The first type is characteristic of colian dune relief; the second one developed under the influence of different natural and artificial drainage stages existing in Potelu complex. Sands and sandy regosols are characterized by a very low humus content and are very often subject to wind erosion; among the recent alluvia the clay-loamy ones have a higher humus content (1-2%).—Copyright 1974, Biological Abstracts, Inc.

RELEASE OF SOIL POTASSIUM ON WETTING AND DRYING, College of Agriculture, Dapoli (India). S. B. Kadrekar, and M. M. Kibe. J Indian Soc Soil Sci. 21(2), p 161-166, 1973.

Descriptors: Soil water, *Potassium, *Potash, *Hydration, *Drying, Soil types.
Identifiers: *Soil potash.

The studies on release of soil potash with different degrees of hydration and drying revealed that under continuous moist conditions, the release of potash took place only at the en over 50-60 days. Alternate wetting followed by oven-drying released maximum potash in the soils. Wetting followed by air-drying brought about early release of soil potash from the nonexchangeable forms. Dongargaon soil (derived from mixed rocks like granites, gneisses, etc.) released maximum potash, followed by Poona soil (basaltic origin) and Dapoli followed by Poona soil (basaltic origin) and Dapoli

soil (laterized basalt) in descending order. The lower moisture level (1/2 moisture equivalent) was conducive to greater release of soil potash.—Copyright 1974, Biological Abstracts, Inc. W77-11982.

MASS TRANSFER STUDIES IN SORBIN POROUS MEDIA: II. EXPERIMENTAL EVALUATION WITH TRITIUM (3H20), New Mexico State Univ., University Park. Dept. of Agronomy.
M.T. van Genuchten, and P. J. Wierenga.

M. 1. van Genuchten, and P. J. Wierenga. Soil Science Society of America Journal, Vol 41, No 2, p 272-278, March-April 1977. 6 fig, 3 tab, 21 ref, 1 append.

Descriptors: *Tritium, *Mass transfer, *Porous media, *Sorption, Diffusion, Curves, Adsorption, Soil aggregates, Unsaturated flow, Mathematical models, Clay loam, Laboratory tests, Equations. Identifiers: Intra-aggregate diffusion, Immobile water, Miscible displacement, Isotope exchange, Soil columns.

A comparison was made between observed tritium effluent concentration distributions and those calculated with a previously published analytical solution for the movement of chemicals through unsaturated, aggregated sorbin media. In the analytical model, the liquid phase of the soil was divided into mobile and immobile regions, with transfer between the two regions diffusion controlled. Effluent data obtained from several displacements of tritium through a 30-cm long columns of Glendale clay loam were used to determine the different parameters in the analytical solution by curve fitting. The data indicated some adsorption or isotopic exchange of tritium during its flow through the soil columns. The amount of immobile water increases with decreasing flow velocity and increasing aggregate size, and varies between 6 and 45% of the total volume of water in the columns. The analytical solution provided an excellent description of the experimental effluent data, and showed that tailing can be explained satisfactorily by diffusional exchange of tritium between mobile and immobile regions of the soil. (See also W77-11982 and W77-11984) (Visocky-ISWS) W77-11983

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA: III. EXPERIMENTAL EVALUATION WITH 2,4,5-T, New Mexico State Univ., University Park. Dept.

of Agronomy.

M. Th. van Genuchten, P. J. Wierenga, and G. A.

Soil Science Society of America Journal, Vol 41, No 2, p 278-285, March-April 1977. 6 fig, 3 tab, 16 ref, append.

Descriptors: *Mass transfer, *Sorption, *Porous media, Diffusion, Adsorption, Unsaturated flow, Hysteresis, Soil aggregates, Clay loam, Laboratory tests, Curves, Mathematical models. Identifiers: Intra-aggregate diffusion, Miscible displacement, 2,4,5-T.

Comparisons were made between observed and calculated effluent concentration distributions for the movement of 2,4,5-T (2,4,5-trichlorophenox-yacetic acid) through 30-cm long unsaturated soil columns. The comparisons were made using both analytical and numerical solutions of a previously published model, which included the effects of intra-aggregate diffusion and adsorption. The results in this study indicated that intra-aggregate diffusion and adsorption/desorption are the main mechanisms responsible for effluent tailing. An estimated 60% of the adsorption was found to occur in the stagnant region of the soil. When

intra-aggregate diffusion was included in the model, the observed adsorption/desorption hysteresis phenomenon found to be significant in several earlier studies was shown to be much less important in describing the observed concentra-tion distributions. (See also W77-11982 and W77-11983) (Visocky-ISWS) W77-11984

ADVANTAGES OF USING HIGH SALT-SODI-UM WATERS IN THE RECLAMATION OF GYPSIFIED HEAVY-TEXTURED SOIL,

Ministry of Agriculture, Cairo (Egypt). Soil and Water Research Inst.

M. El Hakim, H. K. Bakhati, Sh. Milad, and F.

Agricultural Research Review (Cairo), Vol 54, No 4, p 35-44, April, 1976. 1 fig, 3 tab, 17 ref.

Descriptors: *Leaching, *Land reclamation, *Salts, *Alkaline soils, Soil types, Percolation, Ion transport, Irrigation practices, Magnesium, Gyp-sum, Sodium, Calcium, Calcium compounds, Permeability, Water utilization, Flocculation, Saline water.

In a continuation of another study, gypsified sodic soils were subjected to different leaching treatments with salt-free and salt waters diluted in steps to determine how full reclamation may be obtained in the shortest period of time and with the smallest quantity of water. The experiments are described and results presented. It is concluded that beginning leaching with waters of moderate concentrations is more advantageous for reclaiming sodic soils than using salt-free water or waters of high salinity. The initial base status of the soil, the rate of water percolation through the soil, the initial concentration of water applied during the leaching period, the availability of calcium ions e leaching process, are all factors which must be taken into account, and which may interfere in the extent of reclamation that can be realized. (Jamail-Arizona) W77-11994

WATER RETENTION IN SOIL UNDERLAIN BY A COARSE-TEXTURED LAYER: THEORY AND A FIELD APPLICATION,

Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiolo-

gy Div.
B. E. Clothier, D. R. Scotter, and J. P. Kerr.
Soil Science, Vol 123, No 6, p 392-399, June 1977. 8 fig, 1 tab, 22 ref.

Descriptors: *Retention, *Soil water, *Soil tex-ture, *Soil investigations, *Loam, *Field capacity, On-site investigations, Water storage, Soil profiles, Soil physical properties, Soil water move-ment, Hydraulic conductivity, Pores, Permeabili-

Identifiers: *Coarse soil layer, *Sandy loam

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A water retention theory is presented which incor-A water retention theory is presented which incor-porates the physical characteristics of the overly-ing soil, the depth to a coarse layer, and the coar-seness of the underlay. This theory is applied to predict water retention in situ by a Manawatu fine sandy loam, which consists of finer textured soil overlying a coarse layer at 90 cm. Field data on this soil indicates the layering resulted in an additional 5.5 cm of water storage at field capacity, a 31% increase over a similar hypothetical soil with no coarse layer. The water retention curve shape for the soil overlying the coarse stratum is a major factor controlling water stored in the soil profile. Hydraulic conductivity data is not required for reference in application of the theory. (Jahns-Arizone) Arizona) W77-11996

EFFECT ON IRRIGATION WATER QUALITY, SULFURIC ACID AND GYPSUM ON PLANT GROWTH AND ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF PIMA SOIL, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. For primary bibliographic entry see Field 3C. W77-11998 EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE, FRARED SCAN AND PANCHROMATIC IMAGERY FROM PORTAGE LA PRAIRIE, FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst., Karnal

(India).

A. K. Bandyopadhya. J Indian Soc Soil Sci. 20(4), p 407-408, 1972.

Descriptors: *Groundwater, *Water table fluctua-tions, *Water quality, *Saline soils, Depth, Evaporation, Rainfall, *Alkaline soils.

A highly saline-sodic soil was studied in which the water table fluctuated between 107 and 300 cm. Under these conditions it is the quality of the ground water which governs the salinity of the surface soil. This in turn is determined by rainfall and evaporation. Soil salinity was highest when the water table was at maximum depth.-Copyright 1974, Biological Abstracts, Inc. W77-12000

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING SOIL WATER

Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station. For primary bibliographic entry see Field 5A. W77-12005

MICROBIOLOGICAL CHARACTERISTICS OF CERTAIN TYPES OF MARSHY FORESTS OF THE TAVDA TRANSURAL REGION, (IN RUS-G. S. Khrenova

Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 83, p 164-181, 1972.

Descriptors: Soil analysis, *Soil microbiology, *Marshes, Forests, *Microorganisms, Bacteria, Enzymes, Fungi, Seasonal, Soil moisture, Vegetation, Nutrients.

Identifiers: Actinomycetes, *USSR(Tavda transural region).

Soil samples were taken from 5 types of marshy forests in the Tavda transural region (USSR). Quantitative analysis of microorganisms revealed tens and hundreds of millions/g of dry soil. Ammonification occurred under all types of forests. Content of the main groups of microorganisms was higher in 1965 than in 1966, with the exception of spore-forming bacteria and some fungi, actinomycetes, and butyric acid bacteria. Nitrifying bacteria were absent. Seasonal variations in the number of microorganisms depended on the hydrothermic regime of the soil, state of the vegetation covering, presence of nutritive sub stances, and also varied over the course of the vegetation period. Changes in enzymatic activity were also observed. It is suggested after drainage of turfy-marshy soils under the specified types of vegetation, changes in the microflora occur, which are determined by deeper mineralization.—Copyright 1974, Biological Abstracts, Inc.

RECLAMATION OF A SALINE-SODIC SOIL BY THE HIGH SALTWATER-DILUTION METHOD,

Department of Agriculture, Lethbridge (Alberta). Plant Industry Div.
For primary bibliographic entry see Field 3C.

PRELIMINARY STUDY ON SOME SALINE SOILS OF PERU USING A HYDROPHOBIC EMULSION.

Pontificia Universidad Catolica del Peru, Lima. For primary bibliographic entry see Field 3C. W77-12044

MANITOBA, Canada-Manitoba Soil Survey, Winnipeg.

W. Michalyna, and R. G. Eilers. Can J Soil Sci. 53(4), p 445-457, 1973.

Descriptors: *Soil physical properties, Soil management, Remote sensing, Soil analysis, *Soil texture, Canada, *Soil structure, *Soil aggregates,

Data and imagery are presented to show the effects of various soil factors, surface conditions, and soil management practices on the response on IR scan imagery. Generally, sandy soils could be differentiated from medium- and fine-textured soils; medium-textured soils could not be differentiated from the fine-textured ones. Drainage features could readily be differentiated but produced varying response depending on amount of surface moisture and surface structure. Soil structure and aggregation appear to affect response more than the size of the separates (i.e., e texture) in medium- to fine-textured soils. Salinity, silt wash, plat residue and grass anopy resulted in lower response on IR imagery than cul-tivated soils without these conditions. Salt efflorescence, silt wash and residue resulted in a higher response on panchromatic imagery.—Copy-right 1974, Biological Abstracts, Inc. W77-12064

A MULTI-LAYER MODEL FOR GRAVITY DRAINAGE OF UNSATURATED SOIL,

Institut fuer Wasserwirtschaft, Berlin (East Ger-

For primary bibliographic entry see Field 2F. W77-12093

GENERALIZED STREAMFLOW SIMULA-

TION SYSTEM, National Weather Service, Sacramento, Calif. River Forecast Center.

For primary bibliographic entry see Field 2A. W77-12113

EXTENDED FIELD USE OF SCREEN-COVERED THERMOCOUPLE PSYCHROME-TERS.

Intermountain Forest and Range Experiment Station, Ogden, Utah.

R. W. Brown, and R. S. Johnston.
Agronomy Journal, Vol. 68, No. 6, p 995-996,
November-December 1976. 1 fig, 1 tab, 7 ref.

Descriptors: *Soil water, *Soil moisture, Data collection, Instrumentation.

Identifiers: Thermocouples, *Psychrometers, Soil water potential.

The use of screen-covered thermocouple psychrometers for in situ measurements of soil water potential has been criticized because of possible soil and microorganism contamination through the screen covering. Double-junction Peltier psychrometers with a screen covering were installed in the soil under field conditions for periods ranging from 2 to 40 months of continuous exposure, and were then removed and examined for evidence of loss of calibration sensitivity and contamination by soil particles and micro-organ-isms. The uncleaned psychrometers were recalibrated in the laboratory and then disassembled and examined under a microscope (250 times) for contamination. Although slightly more than half of the units lost some sensitivity after field exposure, the average decrease was less than 5%. The psychrometer cavities were all nearly free of soil particles, the thermocouple junctions were shiny, and no evidence of microbial attack was evident. It appears that long-term field exposure of screencovered psychrometers is no more detrimental to

Group 2G-Water In Soils

their performance than that of ceramic or other psychrometers. (Skogerboe, Colorado State) W77-12116

SIMULATION MODEL FOR NUTRIENT UP-TAKE FROM SOIL BY A GROWING PLANT

Purdue Univ., Lafayette, Ind. Dept. of Agronomy. N. Caassen, and S. A. Barber. Agronomy Journal, Vol. 68, No. 6, p 961-964, November-December 1976. 1 fig., 1 tab, 13 ref.

Descriptors: *Simulation analysis, *Mathematical models, Model studies, *Nutrients, Computer programs, Corn(Field), Potassium, Diffusion.
Identifiers: *Nutrient uptake(Soils).

Mathematical models of nutrient uptake by plants are useful for investigating the effect of various soil and plant factors on nutrient flux to plant roots. The objective of this research was to develop a model based on theoretical considerations of the processes of nutrient uptake by plant roots growing in soil and then to test the model ex-perimentally. The soil and plant factors used in the model were to be measured independent of final nutrient uptake. The model for flux by mass flow and diffusion to the root was patterned after that of Nye and Marriott. The absorption kinetics of the root were assumed to follow Michaelis-Menten kinetics. The Nye-Mariott model gives the nutrient concentration at the root with time. From this accumulated uptake per sq cm of root surface with time was calculated. Rate of root growth was as-sumed exponential for the growth of the young plant. Uptake per sq cm of root with time was combined mathematically with rate of root growth to get total uptake with time by the plant. The present program assumes root hairs do not affect uptake and that roots do not compete for nutrients. (Skogerboe-Colorado State) W77-12119

CORN GROWTH AS AFFECTED BY AMMONI-UM VS. NITRATE ABSORBED FROM SOIL Potash Inst., Columbia, Mo. Dept. of Agronomy. For primary bibliographic entry see Field 3F. W77-12124

IRRIGATION SCHEDULES FOR SUGARBEETS ON MEDIUM AND COARSE TEXTURED SOILS IN THE NORTHERN GREAT PLAINS, North Carolina State Univ., Raleigh. Dept. of Soil Science.

For primary bibliographic entry see Field 3F. W77-12126

SOLUBILITY AND AVAILABILITY OF CADMI-UM IN CADMIUM-SLUDGE AMENDED SOIL. Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 5B. W77-12144

EFFECT OF COMPACTION AND MOISTURE CONTENT ON SPECIFIC HEAT AND THER-MAL CAPACITY OF SOILS. Udaipur Univ. (India). M. R. Yadav, and G. S. Saxena. J Indian Soc Soil Sci. 21(2), p 129-132, 1973.

Descriptors: *Moisture content, *Thermal capacity, *Specific heat, Soil moisture, Clays, Soil analysis.

A theoretical relation between thermal capacity and moisture content was derived and tested experimentally. Thermal capacity of moists soil was found to be a linear function of moisture content for sandy as well as clay soils. Compaction appeared to have no significant effect on specific heat of the soils. However, volumetric thermal capacity increased with moisture content.—Copyright 1974, Biological Abstracts, Inc. W77-12161

SOLUTION OF THE ONE-DIMENSIONAL LINEAR MOISTURE FLOW EQUATION WITH IMPLICIT WATER EXTRACTION FUNC-

IMPLICIT WATER EXTRACTION FUNC-TIONS, Arizona Univ., Tucson. Dept. of Mathematics. D. O. Lomen, and A. W. Warrick. Soil Science Society of America Journal, Vol. 40, No. 3, p 342-344, May-June 1976. 3 fig, 2 tab, 4 ref. OWRT B-035-ARIZ(7).

Descriptors: *Model studies, Soil water, *Soil water movement, *Soil moisture, Irrigation, Irrigation effects, *Moisture content. Identifiers: Matrix flux potential, Water extraction, *Moisture flow equation.

Analytical solutions of the one-dimensional steady-state moisture flow equation are presented for several functions modeling soil water extraction. These functions depend directly on the matric flux potential and thus are implicit with depth. A constant surface flux was assumed. Graphs of the matric flux potential and cumulative uptake are given depicting the effect of model parameters and comparing different water extraction functions. The results are useful in obtaining a variety of water extraction distributions. (Skogerboe-Colorado State) W77-12170

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRATION, SOIL MOISTURE, AND SOIL SALINITY REGIMES,

Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-12171

LEACHING OF PHOSPHATE AND SELECTED CATIONS FROM SANDY SOILS AS AFFECTED BY LIME.

Ministry of Agriculture, Bangkok (Thailand). Agricultural Chemistry Div. For primary bibliographic entry see Field 5B.

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN INTO CORN ROOTS GROWN UNDER FIELD CONDITIONS, Ministry of Agriculture, Bangkok (Thailand). Dept. of Agronomy. For primary bibliographic entry see Field 3F. W77-12177

SUBSOIL CHISELING AND SLIP PLOWING EFFECTS ON SOIL PROPERTIES AND WHEAT GROWN ON A STRATIFIED FINE SANDY

Agricultural Research Service, Brawley, Calif. Dept. of Soil Science. M. T. Kaddah.

Agronomy Journal, Vol. 68, No. 1, p 36-39, January-February 1976. 3 fig, 2 tab, 14 ref.

Descriptors: *Soil physical properties, *Soil properties, *Wheat, Soil investigations, California, Crop response, Infiltration, Bulk density, Root development, Cultivation. Identifiers: *Tillage practices, Deep tillage.

Positive crop growth response to deep tillage in sandy soils has been developed in Imperial Valley California. Very little information is available, California. Very little information is available, however, on the effect of different deep tillage operations and the possible causes of the beneficial effects of deep tillage. The present field study was conducted on a stratified fine sandy soil to evaluate the effect of subsoil chiseling and slip plowing to a depth of 90 cm on wheat yield and soil properties. Conventional soil disking to 20 cm depth was compared with two subsoil chiseling and two slip plowing treatments. Subsoil chiseling and two slip plowing treatments. Subsoil chiseling was on 1-m centers in one and and in two

directions, and slip plowing was on 2-m centers in one or two directions. The two directions of deep tillage were at right angles to each other. Signifitillage were at right angies to each other. Signit-cant increases in wheat yield resulted from deep tillage. Grain yield (metric tons/ha) were: 4.50 for disking; 5.15 for subsoil chiseling in two directions; 5.73 for slip plowing one direction; and 6.32 for slip plowing in two directions. (Skogerboe-Colorado State) W77-12178

SOIL PHYSICAL CONDITIONS AFFECTING RICE ROOT GROWTH: BULK DENSITY AND SUBMERGED SOIL TEMPERATURE REGIME

Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
S. Kar, S. B. Varade, T. K. Subramanyam, and B.

P. Ghildyal.

Agronomy Journal, Vol. 68, No. 1, p 23-26, January-February 1976. 5 tab, 15 ref.

Descriptors: *Root development, *Rice, *Soil physical properties, Bulk density, Temperature, Greenhouse experiments, Growth rates, *Plant

Information is lacking on the performance of the rice plant due to variations in temperature regimes in association with other soil physical properties. This investigation, carried out under controlled greenhouse conditions, evaluate the influence of temperature and mechanical impedance of soil, as well as of their interaction, on root and shoot growth of rice. Four submerged soil temperature regimes thermoregulated in water baths, indicated that the maximum root and shoot growth of rice occurred at 37 and 25C. Irrespective of the bulk density of soil, the total number of roots at the base and the dry weight and volume of the rice root system significantly increased as the submerged soil temperature regime increased from 27 to 15C to 37 to 25C, but decreased at 42 to 30C. (Skogerboe-Colorado State) W77-12179

2H. Lakes

A YEARLY CYCLE OF CHANGES IN DYNAMICS OF PRODUCTION OF THE CHEMOAUTOTROPHIC BACTERIA IN BOTTOM SEDIMENTS OF A WATER BODY, Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
For primary bibliographic entry see Field 5C.
W77-11505

ACTIVITY OF HYDROLYTIC ENZYMES IN ACTIVITY OF HYDROLYTIC ENZYMES IN WATER AND BIOMASS OF PLANKTONIC ORGANISMS IN A RESERVOIR OF AN EUTROPHIC TYPE IN THE LAGOON OF KURSIU MARIOS, (IN RUSSIAN), Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of

Botany. For primary bibliographic entry see Field 5C. W77-11509

THE BIOMASS, ORGANIC MATTER CONTENTS AND CALORIFIC VALUES OF MACROPHYTES IN THE LAKES OF THE SZESZUPA DRAINAGE AREA. Polish Academy of Sciences, Mikolajki (Poland). Dept. of Applied Limnology. For primary bibliographic entry see Field 5C. W77-11511

MERCURY IN BOTTOM SEDIMENTS OF RIET-VLEI RESERVOIR, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Chemistry. For primary bibliographic entry see Field 5B. W77-11512

EFFECTS OF DISSOLVED OXYGEN ON SUR-VIVAL AND BEHAVIOR OF SELECTED FISHES OF WESTERN LAKE ERIE, Tennessee Game and Fish Commission, Nashville. For primary bibliographic entry see Field 5C.

W77-11514

LAKES SORELL AND CRESCENT - A
TASMANIAN PARADOX,
New South Wales Inst. of Tech., Broadway
(Australia). School of Life Sciences.

For primary bibliographic entry see Field 5C. W77-11534

ANALYSIS OF THE TEMPORAL BEHAVIOUR OF THE LEVEL OF LAKE MALAWI,

University of the Witwatersrand, Johannesburg (South Africa). Dept. of Geography and Environ-T. G. Dver.

South African Journal of Science, Vol. 72, No. 12, p 381-382, December 1976. 3 fig, 5 ref.

Descriptors: *Water level fluctuations, Water resources, *Time series analysis, Data analysis, Forecasting, Model studies, *Temporal distribution, Lakes.

Identifiers: Lake Malawi, Malawi, Southern Africa.

If Lake Malawi is to be tapped for irrigation purposes, knowledge of temporal level fluctuations are necessary. This paper analyses the time series of annual maximum lake levels. The results for minima are similar and are not presented. Records were obtained for the period 1895-1975. Apart from providing information useful in the utilization of water resources, these data also give an index of climate for that part of Africa. (So African Water Info Center) W77-11565

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS 3. ROODEPLAAT DAM,

National Inst. for Water Research, Pretoria (South Africa).

For primary bibliographic entry see Field 5C. W77-11568

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. IV. VAAL DAM, National Inst. for Water Research, Pretoria (South

For primary bibliographic entry see Field 5C. W77-11575

SEVERAL MODELS FOR WATER-AIR TEM-PERATURE RELATIONSHIPS OF SOME AFRICAN LAKES, Rhodesia Univ., Salisbury. Dept. of Agriculture.

D. Clay.

Water SA., Vol. 2, No. 2, p 61-66, 1976. 5 tab, 1 fig. 14 ref.

Descriptors: *Water temperature, Forecasting, *Model studies, Africa, Lakes, *Model studies, *Air temperature.

Identifiers: Lake Kariba, Lake Kyle, Hardap Dam, Lake McIlwaine, Lake Tchad, Southern Africa, Rhodesia, South West Africa, Nigeria.

A series of models have been tested for prediction of average monthly water temperatures of lakes at one meter depth from air temperatures. Models for Lake Kariba, Rhodesia, Lake Kyle, Rhodesia and Hardap Dam, South West Africa have an average accuracy of better than, 75 C each month, while Lake McIlwaine, Rhodesia and Lake Tchad, Nigeria have an average accuracy of better than 1,0 C each month. These and other models can be improved in time by routine observation. At improved in time by routine observation. At present they allow an estimation to be made as to

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SCIENTIFIC INFORMATION IN THE DECI-SION TO DAM GLEN CANYON, California Univ., Los Angeles. Inst. of Geophysics

and Planetary Physics.
For primary bibliographic entry see Field 8E.
W77-11583

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY. WISCONSIN,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab. For primary bibliographic entry see Field 5C.

BREAKING WAVE CRITERION ON A SLOP-

ING BEACH, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 8B. W77-11585

SUBSTANTIATION OF THE PRIESTLEY AND TAYLOR PARAMETER ALPHA = 1.26 FOR POTENTIAL EVAPORATION IN HIGH LATITUDES.

Atmospheric Environment Service, Downsview (Ontario).

For primary bibliographic entry see Field 2D. W77-11599

SHORT-PERIOD INTERNAL WAVES IN THE VICINITY OF A RIVER-INDUCED SHEAR ZONE IN A FJORD LAKE, Canada Centre for Inland Waters, Burlington

(Ontario).

P. F. Hamblin. Journal of Geophysical Research, Vol. 82, No. 21, p 3167-3174, July 20, 1977. 9 fig, 3 ref.

Descriptors: *Internal waves, *Lakes, *Canada, On-site investigations, Model studies, Mathemati-cal models, Rivers, Mixing, Turbulence, Shear, Seiches, Turbidity, Temperature, Water temperature, Profiles, Frequency analysis, Statistical methods, Fjords.

Identifiers: *Kamloops Lake(British Columbia).

Observations of isotherm displacements in a lake through which a large river flows were used to study the behavior of short-period internal waves. Selected time series as well as spectra suggest a generating mechanism for short-period internal waves localized in the region of the inflowing water which may be associated with the formation of a mixed zone imbedded in the stratified column. The mixed zone, in turn, is considered to originate from turbulent instability due to vertical shear associated with the river inflow and long-period internal seiches. The model for the collapse of a mixed region by Schooley and Hughes accounts for observed spectral peaks at frequencies lower than the Brunt-Vaisala frequency. (Sims-ISWS)

THE EFFECT OF SALINITY OF QARUN LAKE ON THE ADJACENT SOIL, Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

R. M. Abdel-Aal, A. Abd-El-Wahed, F. El-Bogdady, and M. S. Abd El-Gawad.

Agricultural Research Review (Cairo), Vol 54, No 4, April, 1976. p 177-187, 2 fig, 4 tab, 11 ref.

Descriptors: *Lakes, *Lake shores, *Soil proper-ties, *Salinity, *Salts, Shales, Geomorphology, Sedimentary rocks, Clays, Water properties, Saline water, Saline soils, Lake basins, Anions,

the heat energy available for biological production in a water body. (So African Water Info Center)
W77-11577
Cations, Inflow, Soil types, Arid lands, Calcium carbonate, Deserts, Geologic history, Topography, Gypsum, Calcareous soils, Limestones. Identifiers: Fayoum depression, Nile River basin, Qarun lake, Mediterranean Sea, Egypt.

> A study was undertaken to elucidate the effect of salt constituents and salinity of a lake fed from the Nile River on the characteristics of adjacent soil. Six water samples were taken from different loca-tions in the lake, six representative soil profiles were obtained from the shore, and a sample was taken from the lake bottom. Particle size distribution analysis was carried out, calcium carbonate and organic matter contents were determined, and soil water extract and lake water tests were carried out for anions and cations. From analysis of the data it was concluded that the differences in soil characteristics reflected the effect of the parent material in three of the soil profiles, while the influence of the lake's saline water influenced soil characteristics in the other three profiles. (Ullery-W77-11625

> THE CICHLID GROWTH OF FISH TYLOCHROMIS BANGWELENSIS IN LAKE BANGWEULU, ZAMBIA, Oak Ridge National Lab., Tenn. Environmental

J. S. Griffith.

Transactions of the American Fisheries Society, Vol 106, No 2, March 1977, p 146-150, 1 fig, 3 tab,

Descriptors: Animal growth, Fish, Lakes, *Growth rates, Temperature, Africa. Identifiers: Scale examination, Annuli, Lake Bangweulu(Zambia).

Scale examinations were used to assess growth of the child fish, tylochromis bangwelensis. Discontinuities in circuli which appeared to be valid annuli were seen on the scales of yearling fish during August-October and on the scales of older fish later in the season. It was concluded that these discontinuities were due changes in lake temperatures. At the end of the first year, fish had obtained an average length of 6.8 cm. Growth in subtanned an average length of 6.8 cm. Growth in subsequent years averaged 2-3 cm until a maximum age of 7 years. Males grew slightly faster than females. Both sexes initially matured at a length of 11 to 12 cm and an age of 2 years, although most fish did not reproduce until 1 year and 3-4 cm later. (Chilton-QDMI). (Chilton-ORNL) W77-11646

FROM CHAR LAKE, RESOL NORTHWEST TERRITORIES, Biol. Stn., Saint Andrews, N. B., Can. For primary bibliographic entry see Field 5C. W77-11652 EMERGENCE OF CHIRONOMIDAE (DIPTERA)

LAKE ONTARIO ATLAS: CHEMISTRY. For primary bibliographic entry see Field 5C. W77-11654 New York Sea Grant Inst., Albany

FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 2L. W77-11656 CUIDEROOK TO GEOLOGIC AND REACH

LIMNOLOGICAL STUDIES OF THE ONO RESERVOIR: THIRD REPORT, (IN JAPANESE). For primary bibliographic entry see Field 5C. W77-11713

Group 2H-Lakes

PRESSURE EFFECTS ON GREAT LAKES VER-

TICAL CONTROL, National Oceanic and Atmospheric Administra-tion, Ann Arbor, Mich. Great Lakes Environmen-tal Research Lab.

F. H. Ouinn. Journal of the Surveying and Mapping Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. SU1, p 31-37, December 1976. 2 fig, 6 tab, 3 ref.

Descriptors: *Great Lakes, *Lakes, Pressure, Effects, *Water levels, *Control, *Surveys, Atfects, *Water levels, *Control, *Surveys, Atmospheric pressure.
Identifiers: *Pressure responses, *Vertical indica-

tors, Gravitation, Surveying, Hydrostatic analysis.

Described is a study which investigated the warp ing effects of atmospheric pressure fields on the assumed level geopotential Great Lakes water surfaces during the 28-month period used in establishing the 1955 International Great Lakes Datum. The hydrostatic analysis used in the study indicated variations in lake water surface elevations up to 4 cm during the study period. These variations compared with computed gravitational effects similar to those included in the 1955 International Great Lakes Datum establishment. The at-mospheric pressure effects were found to be of the same order of magnitude as those resulting from the nonuniform gravitational forces. Thus, the assumption that the water surfaces of the Great Lakes are level geopotential surfaces is erroneous and atmospheric pressure corrections should be included when establishing and revising the verti-cal control on the Great Lakes. (Bell-Cornell)

A TIME-DEPENDENT MODEL OF THE LAKE-AVERAGED, VERTICAL TEMPERATURE DISTRIBUTION OF LAKES,

Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.

W. A. Tucker, and A. W. Green.

Limnology and Oceanography, Vol 22, No 4, p 687-699, July 1977. 7 fig, 2 tab, 40 ref.

Descriptors: *Water temperature, *Lakes, *Lake Ontario, *Model studies, Mathematic models, Solar radiation, Energy, Mixing, Winds, Waves(Water), Hypolimnion, Profiles, Limnology, Foreign countries, Foreign research.
Identifiers: *Llyn Cwellyn(Wales), *Wales,
Kinetic energy, *Vertical temperature distribu-

A model for predicting the time-dependent vertical thermal structure of lakes was presented. Radia tive heating with depth, mixing induced by the surface wave field, and turbulent energy exchange were included as lake-averaged processes. The model was designed to be applicable to a wide range of lake sizes. Comparison of predictions with horizontally averaged observations from Lake Ontario during IFYGL and unaveraged (local) observations from Llyn Cwellyn, Wales, showed good agreement. (Sims-ISWS) W77-11799

INTERNAL FREE OSCILLATIONS IN LAKE

National Oceanic and Atmospheric Administra-tion, Ann Arbor, Mich. Great Lakes Environmental Research Lab.

D. J. Schwab. Limnology and Oceanography, Vol 22, No 4, p 700-708, July 1977. 4 fig, 1 tab, 12 ref.

Descriptors: *Internal waves, *Lake Ontario, *Model studies, Mathematic models Waves(Water), Lakes, Mathematics, Limnology. models, Identifiers: Kelvin-type waves, Poincare-type waves, Oscillations, Power spectra.

A numerical procedure was used to calculate some of the internal free modes of oscillation in a two-

layer model of Lake Ontario, assuming a uniform equivalent depth. The modes fall into two categories, one set resembling Kelvin-type waves and the other resembling Poincare-type waves. Observa-tional evidence from Lake Ontario agreed qualitatively with the properties of the two types of modes. (Sims-ISWS) W77-11800

INCOMPLETE EXTRACTION OF RAPIDLY SETTLING PARTICLES FROM WATER SAM-

Woods Hole Oceanographic Inst., Mass. Joint Program in Oceanography.
For primary bibliographic entry see Field 2L.

CLOSING, REPLICATE-SAMPLE, SEDI-

MENT TRAP,
California Univ., Davis. Div. of Environmental Studies.

For primary bibliographic entry see Field 2J. W77-11802

A THREE-DIMENSIONAL MODEL OF LAKE ONTARIO'S SUMMER CIRCULATION I. COM-PARISON WITH OBSERVATIONS, Massachusetts Inst. of Tech., Cambridge. Dept. of

Earth and Planetary Sciences.

Journal of Physical Oceanography, Vol 7, No 4, p 591-601, July 1977. 10 fig, 19 ref, 1 append. NOAA 03-5-022-57

Descriptors: *Lake Ontario, *Water circulation, *Water temperature, *Model studies, *Great Lakes, Mathematical models, Lakes, Circulation, Currents(Water), Mathematics, Coriolis force, Density, Heat transfer, Winds, Velocity, Limnolo-

Observations of Lake Ontario during the International Field Year for the Great Lakes were used to develop a three-dimensional numerical model for calculating temperature and current. The model has a variable grid resolution and a horizontal smoothing which filters out small-scale vertical motion caused by truncation error but has little effect on the strong currents of the coastal boundary layer. Resolution of the shore zones and reduced horizontal smoothing improved simulation of both long-term mean flow and current reversals due to low-frequency waves. (Sims-ISWS) W77-11808

A SIMPLE MODEL OF LAKE ONTARIO'S COASTAL BOUNDARY LAYER,

Massachusetts Inst. of Tech., Cambridge. Dept. of

Earth and Planetary Sciences.
J. R. Bennett, and E. J. Lindstrom.
Journal of Physical Oceanography, Vol 7, No 4, p
620-625, July 1977. 6 fig, 1 tab, 14 ref. NOAA 03-

Descriptors: *Lakes, *Water circulation, *Winds, *Lake Ontario, *Model studies, Mathematical models, Circulation, Water temperature, Thermocline, Coasts, Currents(Water), Internal waves,

Limnology.

Identifiers: Longshore transport, Wind forcing, Wind stress, International Field Year for the Great

An empirical forced wave model of currents and thermocline displacements in the coastal zone of Lake Ontario was derived from data from the In-ternational Field Year for the Great Lakes (1972). The model consisted of three linear wave equa-tions for predicting the depth of the thermocline, tis slope, and the longshore volume transport from the wind. The empirical phase speeds were con-sistent with internal Kelvin wave and topographic wave theory, and the response to a unit longshore wind stress was consistent with cross section models of long lakes. (Sims-ISWS) W77-11811

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULA-TIONS IN LAKES, Wisconsin Univ.-Madison. Water Chemistry Lab.

For primary bibliographic entry see Field 5C.

AUTOMATIC CATEGORIZATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MUL-TISPECTRAL SCANNER (S-192) DATA,

Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.

For primary bibliographic entry see Field 7B. W77-11875

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,

Ohio State Univ., Columbus.
N. W. Britt. J. T. Addis, and R. Engel. Bull Ohio Biol Surv. 4(3), p 1-85, 1973.

Canada, Surveys, Benthos, Oligochaetes, Crustaceans, *Benthic fauna, Diptera, Zooplankton, Water pollution, Fisheries, Food chains, Nutrients. Descriptors: *Lake Erie, *Limnology, Islands,

Identifiers: Aphanizomenon, Chydorus sphaer-icus, Diaptomus siciloides, Dinoflagellates, Eu-rytemora affinis, Hexagenia, Microcystis, Oecetis, Oscillatoria, Pandorina morum, Oecetis, Oscillatoria, *Tanyopodinae.

This survey, carried out between 1959 and 1965, was initiated following the decline of the fisheries in western Lake Erie (USA and Canada). Changes in the benthic fauna are very clear: the Hexagenia-Oecetis (Ephemeroptera and Trichoptera) community has been virtually eliminated and the bottom fauna is now dominated by Oligochaeta and Chironomidae. The population structure of the Diptera indicates that present conditions favor the pollution resistant Tanyopodinae over the Chironomidae. The decline of the Ephemeroptera seems to be related to the occurrence of periods of low oxygen concentrations in the bottom waters. Changes are also noted in the plankton popula-tions. Microcystis has replaced Aphanizomenon and Oscillatoria as major constituents of the Cyanophyceae. Filamentous algae are appearing in larger numbers and Pandorina morum is m abundant than formerly. Dinoflagellates are also becoming a major component of the plankton. In the zooplankton Eurytemora affinis has become established in the area. Chydorus sphaericus is in-creasing in abundance. in general, cladocerans have increased in abundance since the 1930's. A marked increase in the numbers of Diaptomus sicimarked increases in the numbers of paptonius state cloides has also occurred. The cause of these changes are probably increased quantities of effluents from man's activities in the lake watershed. Although the surface waters in the center of the lake are of reasonable quality, in the inshore and deeper waters of the lake anaerobic conditions arise due to the oxidation of the organic load in the lake. The addition of nutrients increases production which adds further organic material - a form of self-pollution. This recycling of material makes it unlikely that pollution control measures will show an immediate effect. Copyright 1974, Biological Abstracts, Inc.

CHANGES IN AQUATIC MACROPHYTES AC-COMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA,

Cornell Univ., Ithaca, N.Y. Center for Environ-

For primary bibliographic entry see Field 5A. W77-11940

EFFECTS OF SALTON SEA WATER ON THE EGGS AND LARVAE OF BAIRDIELLA ICISTIA (PI3CES: SCIAENIDAE),
Hawaii Inst. of Marine Biology, Honolulu.

For primary bibliographic entry see Field 5C. W77-12025

HEAVY-METAL CONTAMINATION BY AT-MOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS,

Toronto Univ. (Ontario). Dept. of Geology,; Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5B.
W77-12027

CONCENTRATION PATTERN OF CHEMICAL CONSTITUENTS IN A PAPER MILL'S EFFLUENT PLUME: DYNAMICS AND MODEL, Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch. For primary bibliographic entry see Field 5B. W77-12041

A CHARACTERIZATION OF THE SOURCES OF PETROLEUM HYDROCARBONS IN LAKE

WASHINGTON, Washington Univ., Seattle. Dept. of Chemistry. For primary bibliographic entry see Field 5B. W77-12043

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF NIPIGON BAY, LAKE SUPERIOR, WESTERN Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5C. W77-12055

CHARACTERIZATION OF SUSPENDED PAR-TICLES IN SOME PULP AND PAPER MILL EF-

FLUENT PLUMES, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5B. W77-12058

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT, Canada Centre for Inland Waters, Burlington

(Ontario). For primar W77-12059 ary bibliographic entry see Field 5B.

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5B. W77-12065

CALORIC CHANGES ALONG PULP AND PAPER MILL EFFLUENT PLUMES, For primary bibliographic entry see Field 5B. W77-12066 Canada Centre for Inland Waters.

C.

E:

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5B.

W77-12067

W77-12068

DISTRIBUTION OF SOME ORGANIC COM-POUNDS IN THE RECEIVING WATERS OF A KRAFT PULP AND PAPER MILL.

Canada Centre for Inland Waters, Burlington (Ontario), For primary bibliographic entry see Field 5B.

A MATHEMATICAL MODEL FOR SIMULATING THE TEMPERATURE STRUCTURE OF STRATIFIED RESERVOIRS AND ITS USE IN RESERVOIR OUTLET DESIGN,

Water Resources Engineers, Inc., Walnut Creek,

For primary bibliographic entry see Field 5B. W77-12114

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,

Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center. For primary bibliographic entry see Field 5G. W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDI-MENT-WATER-PHOSPHORUS RELATION-

Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5G. W77-12150

VERTICAL GRADIENTS IN ARTIFICIAL SUB-STRATE-ASSOCIATED PROTOZOAN COMMU-NITY STRUCTURE IN A STRATIFIED FRESH-WATER LAKE,

Vanderbilt Univ., Nashville, Tenn. Dept. of Biolo-

For primary bibliographic entry see Field 5C. W77-12196

OBSERVATIONS OF AN ASH LAGOON SPILL ON THE NEW RIVER, VIRGINIA, Virginia Polytechnic Inst. and State Univ.,

Blacksburg. Dept. of Biology. For primary bibliographic entry see Field 5B. W77-12219

SYNCHRONOUS FLUORESCENCE TROSCOPY AND ITS APPLICATION TO IN-DIGENOUS AND PETROLEUM-DERIVED HYDROCARBONS IN LACUSTRINE SEDI-

Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 5A.
W77-12225

A 96-HOUR SEDIMENT BIOASSAY OF DU-LUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST OR-

GANISMS, Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies Lab.

For primary bibliographic entry see Field 5A. W77-12240

2I. Water In Plants

FRESHWATER ALGAE OF SOUTHERN AFRICA:3. PLEUROTAENIUM BREVE RACIBORSKI VAR. ENGLERI (SCHMIDLE) KRIEGER AND PENIUM GONATOZYGIFORME CLAASSEN SP. NOV. FROM TRANSVAAL, Pretoria Univ. (South Africa). Dept. of Botany.

For primary bibliographic entry see Field 5C. W77-11546

A BEW SPECIES OF MASTACEMBELUS (PISCES, MASTACEMBELIDAE) FROM THE UPPER ZAMBEZI RIVER, WITH A DISCUSSION OF THE TAXONOMY OF THE GENUS FROM THIS SYSTEM, Albany Museum, Grahamstown (South Africa).

P. H. Skelton.

Annals of the Cape Provincial Museum (Natural History), Vol 11, No 6, p 103-116, December 1976. 3 fig, 5 tab, 24 ref.

Descriptors: *Fish populations, Distribution, Aquatic habitats, Biology, Color, *Systematics. Identifiers: Zambezi River, *Mastacembelidae, Southern Africa.

The upper Zambezi River sub-system includes the Okavango River and Swamps as well as the Zambezi River itself and its tributaries above the Victoria Falls. Two Mastacembelus species are known and recognized from this region. Recent collections of fishes taken from the Zambezi River and its tributory and flood-plain system in the Eastern Caprivi area and sent to the Albany Museum, Grahamstown and the Queen Victoria Museum, Salisbury, include a species of Mastacembe lus which cannot be referred to either M. mellandi or M. mutombotombo, or any other described species of this genus in Africa. The species is described as new to science. (So African Water Info Center)

THE LARVAL AND PUPAL STAGES OF UGAN-DATRICHIA MOSELY (TRICHOPTERA: HYDROPTILIDAE) FROM RHODESIA, WITH THE DESCRIPTION OF A NEW SPECIES, National Inst. for Water Research, Pretoria (South

Africa).

K. M. Scott.

Annals of the Cape Provincial Museum (Natural History), Vol 11, No 7, p 117-127, December 1976. 22 fig. 4 ref.

Descriptors: *Aquatic insects, Growth stage, Lar-

Identifiers: Bundi River, Chimanimani, Ugan-datrichia rhodesiensis, Trichoptera, Hydrop-tilidae, *Rhodesia, Southern Africa.

A new species of Ugandatrichia Mosely, U. rhode-siensis (Hydroptilidae), is described from the Chimanimani National Park in Rhodesia, as are its larval and pupal stages. The larval and pupal stages of this genus were previously unknown, as are the immature stages of Microptila Ris, with which it may be synonymous. The relationships of the young stages are briefly discussed. (So Africa Water Info Center) W77-11557

WATER RELATIONS AND GROWTH OF SOYBEANS IN DRYING SOIL,

Agricultural Research Service, Stoneville, Mo. L. G. Heatherly, W. J. Russell, and T. M. Hinckley.

Crop Science, Vol 17, No 3, p 381-386, May-June 1977. 7 fig, 1 tab, 28 ref.

Descriptors: *Soybeans, *Moisture stress, *Plant growth, *Crop response, *Drying, *Soil-water-plant relationships, Xylem, Soil moisture, Evaporation, Wilting, Vapor pressure, Root zone,

Identifiers: Xylem pressure potential, Leaf diffusive resistance, Soil water potential, Vapor pres-

Group 21-Water In Plants

A study was conducted on soybean plants (Glycine max (L.) Merrill 'Hill') to determine the effect of a drying soil on xylem pressure potential (P), leaf enlargement, and leaf diffusive resistance. Plants were grown in moist soil in the greenhouse for 63 days, then subjected to a 9-day drying cycle. The xylem pressure potential, measured three times each day, decreased linearly with and was significantly related to decreasing base (presunrise) soil water potential (SWP) of drying soil. Results indicated the possibility of estimating P of plants in a drying soil from base values of SWP. The P levels of plants growing in wet soil were influenced by extremes in at-mospheric demand and by SWP; the largest decline occurred between the presunrise and 1000 to 1200 hour time periods of each day in both soil environments. Presunrise wilting of plants in the drying soil occurred at day 7 when the corresponding base P was about -18 bars. Leaf enlargement declines occurred with a base P of about -4.5 bars, with cessation occurring between -10 and 12.9 bars. Leaf diffusive resistance increased as SWP and P decreased. (Jahns-Arizona) W77-11622

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN

CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands).
Dept. of Physics and Meteorology. For primary bibliographic entry see Field 3F. W77-11631

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF IMPROVEMENT.

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

B. G. Bishay, and H. K. Bakhati Agricultural Research Review (Cairo), Vol 54, No 4, April, 1976. p 63-74, 4 tab, 5 fig, 5 ref.

Descriptors: *Soil-water-plant relationships, *Soil moisture, *Water management(Applied), *Fruit crops, *Soil management, *Soil treatment, Soil dynamics, Infiltration, Moisture content, Irrigation, Irrigation practices, Induced infiltration, Land management, Arid lands, Semi-arid cli-mates, Soil density, Soil structure, Trees, Citrus fruits, Adsorption, Alluvium, Clay loam, Agriculture soil amendments.

Identifiers: Leaf drip zone, Polyacrylamide, Egypt.

The effect of a long-time citrus plantation on the hydraulic transmission properties of an alluvial clay loam soil in Egypt was studied. Additionally, the effect of applying the hydrophilic soil condi-tioner Polyacrylamide (PAM) on the soil was determined in order to obtain an idea of the relative effects of materials used in research on water transmission modification. Two representative soil samples were collected, the first from inside the leaf drip zone and the second from outside the zone. Experimental results indicated no difference in moisture retention curves and pore size distribution between soil inside and outside the leaf drip zone. Due to more hydrophobic soil properties, the infiltration rate of soil inside the zone is smaller than outside the zone. Application of PAM to the soils increased diffusivity, sorptivity, angle of contact, and draining pores essential to land and water management. (Ullery-Arizona)

WATER STATUS AND DISTRIBUTION OF CYANIDIUM CALDERIUM IN SOIL, California Univ., Los Angeles. Dept. of Bac-

teriology. For primary bibliographic entry see Field 2G. W77-11788 AND UNDER TWO FORESTS IN MINNESOTA, Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station. For primary bibliographic entry see Field 2K.

PRECIPITATION NUTRIENTS IN THE OPEN

LEAF CONDUCTANCE RESPONSE TO HUMIDITY AND WATER TRANSPORT IN Univ., Riverside. Dept. of Plant California

For primary bibliographic entry see Field 3F.

STOMATAL RESPONSE TO LEAF WATER POTENTIAL AS AFFECTED BY PRECONDITIONING WATER STRESS IN THE FIELD, Texas A and M Univ., College Station. Dept. of

Soil and Crop Science. For primary bibliographic entry see Field 3F. W77-11959

YIELD AND MOISTURE USE PATTERN OF RABI CROPS GROWN UNDER RAINFED CON-DITIONS OF EASTERN U.P.,

Banaras Hindus Univ., Varanasi (India). Dryland Agriculture Research Project. For primary bibliographic entry see Field 3F. W77-11992

NOTE ON DIVERGENCE IN SOME VARIETIES OF WHEAT GROWN UNDER RAIN-FED CON-

Indian Agricultural Research Inst., New Delhi. Div. of Genetics. For primary bibliographic entry see Field 3F.

W77-12004

THE MODEL OF THE WATER BALANCE AND

THE MODEL OF THE WATER BALANCE AND NUTRIENT UPTAKE AS A BASIS FOR HYDROLOGICAL, AGRO-HYDROLOGICAL AND OTHER PROJECTS, Institute for Land and Water Management Research, Wageningen (Netherlands). For primary bibliographic entry see Field 2A. W77-12091

A SYSTEM AND PROGRAM FOR MONITOR-ING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION, Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 7B. W77-12120

PHOTOSYNTHATE DISTRIBUTION IN NATU-RAL STANDS OF SALT WATER CORDGRAS Rhode Island Univ., Kingston. Dept. of Plant and

R. J. Hull, D. M. Sullivan, and R. W. Lytle, Jr. Agronomy Journal, Vol. 68, No. 6, p 969-972, November-December 1976. 4 tab, 14 ref.

Descriptors: *Tidal marshes, Estuarine environ-ment, Grasses, *Salt marshes. Identifiers: *Cordgrass, Photosynthate.

Spartina alterniflora Loisel, is a major grass species of Atlantic coast tidal marshes which contributes heavily to the primary productivity of estuarine ecosystems. As human activity increases in marsh areas, the capability of marsh vegetation to withstand disturbance must be understood and constitute the basis for formulating sound management programs. Toward this end, the seasonal distribution of photoassimilated carbon was studied in S. alterniflora growing under natural conditions. Single culms were exposed to 14CO2 at various times during the 1970 and 1971 growing seasons. Plants were harvested 1, 3, and 7 days following exposure to 14CO2 subdivided into leaves, culm, rhizomes, and roots; and each portion assayed for rnizomes, and roots; and each portion assayed to 14C. Assimilate translocation reached a more or less stable distribution pattern within 24 hours. Throughout much of the growing season, most photosynthate was retained in leaf and culm tissue with less than 10% translocated to roots and rhizomes. Only during early autumn was substantial photosynthate translocated into rhizomes. This and seasonal carbohydrate levels within perennial organs indicate that the stability of S. alterniflora stands may be adversely affected by summer disturbance especially defoliation. (Skogerboe-W77-12173

NITROGEN ACCUMULATION AND TRANSLO-CATION IN CORN GENOTYPES FOLLOWING SILKING.

Guelph Univ. (Ontario). Dept. of Soil Science. For primary bibliographic entry see Field 3F. W77-12174

NITRATE-N AND TOTAL N CONCENTRATION RELATIONSHIPS IN SEVERAL PLANT SPE-CIES,

National Fertilizer Development Center, Muscle Shoals, Ala. For primary bibliographic entry see Field 3F. W77-12176

2.I. Erosion and Sedimentation

METAL ENRICHMENT OF SEDIMENTS IN IN-LAND WATERS - THE JUKSKEI AND HEN-NOPS RIVER DRAINAGE SYSTEMS, Pretoria Univ. (South Africa). Dept. of Chemistry. For primary bibliographic entry see Field 5B. W77-11578

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W77-11582

NUMERICAL MODEL FOR DISCRETE SET-

TLING, Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-11593

VEGETAL COVER TO ESTIMATE SOIL ERO-SION HAZARD IN RHODESIA, Barrowdale

Hatcliffe Engineering Centre, Barrowdale (Rhodesia). Dept. of Conservation and Extension. For primary bibliographic entry see Field 4D. W77-11630 A PRELIMINARY OCEANOGRAPHIC SURVEY

OF THE DAMARISCOTTA RIVER ESTUARY, OF THE DAMARISCOTTA RIVER ESTUARY, LINCOLN COUNTY, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 5B. W77-11657

INTERNAL SEDIMENTARY STRUCTURES, VERTICAL STRATIGRAPHIC SEQUENCES, AND GRAIN-SIZE PARAMETER VARIATIONS IN A TRANSGRESSIVE COASTAL BARRIER COMPLEX: THE ATLANTIC COAST OF DELAWARE, Delaware Univ., Newark. Coll. of Marine Studies.

Sea Grant Technical Report No. DEL-SG-10-77, 1977. 303 p, 84 fig, 2 tab, 362 ref, append. \$6.00.

Erosion and Sedimentation—Group 2J

Descriptors: *Delaware, *Sedimentary structures, *Barrier islands, Barriers, Atlantic Ocean. Identifiers: *Stratigraphic sequences, Transgressive sequences, Regressive sequences.

Detailed information on the internal sedimentary structures, vertical stratigraphic sequences, and grain-size vertical strangraphic sequences, and grain-size variations in a transgressive coastal barrier complex is provided. A 27-m long stretch on the Atlantic coast of Delaware, extending from Cape Henlopen in the north to Cottonpatch Hill in the south has been thoroughly investigated. Detailed sedimentary structures are presented, based on core photographs. Four major variations of the coastal transgressive barrier complex found within the area of study include (1) the Cape Henlopen spit-beach-dune complex; (2) barrier against marsh; (3) beach against pre-Holocene (Pleistocene) highland; and (4) barrier-tidal deltalagoon, which included a baymouth barrier and a tidal inlet section. Each of these variations has its own characteristic vertical sequences. Evidence indicates that this barrier complex originated elsewhere further seaward and migrated to its present position. The greater thickness of transpressive sequence deposits in ancestral stream val-leys crossing the barrier complex compared to that at other sections gives it a better potential for eservation under a cover of marine sediments. preservation under a cover of marine sediments. Vertical sedimentary sequences of coarse sedi-ments over fine sediments occur in both transgressive and regressive coastal environmental sequences. (NOAA)
W77-11663

EROSION OF THE TARKIO DRAINAGE SYSTEM, 1845-1976, Agricultural Research Service, Columbia, Mo.

R. F. Piest, L. S. Elliott, and R. G. Spomer. Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 485-488, May-June 1977. 3 fig, 2 tab, 4 ref.

Descriptors: *Stream erosion, *Channel erosion, *Rivers, *Iowa, *Missouri, Runoff, Drainage, Soils, Soil texture, Loess, Degradation(Slope) Degradation(Stream), Scour, Cultivated lands, Agriculture, Gullies, Geomorphology, Slopes, Persical Visions. Erosion, History. Identifiers: *Tarkio River(Iowa-Mo).

Historic and geologic evidence indicated that channel and gully erosion was nearly nonexistent when the loess-mantled Tarkio Basin of southwestern Iowa and northwestern Missouri was settled about 1845. The pattern of channel development-gleaned from old land surveys, records from drainage districts, highway bridge surveys, and other documents-is related to the intensity of agriculture and is linked complexly to the general runoff regimen and to changes in soil water content along channel boundaries. Some channel enlargement during the post-settlement period, 1845-1976, is quantified. Channel profile changes during recent years, 1939-1976, were reconstructed. The excessive scour in a channel reach of West Tarkio Creek was explained tentatively on the basis of geomorphic principles and differences in substrata erodibility. (Sims-ISWS) W77-11796

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD MARSH, OHIO,

Ohio State Univ., Columbus. Dept. of Agronomy. S. S. Hundal, G. S. Taylor, and G. O. Schwab. Transactions of the American Society of Agricultural Engineers, Vol 20, No 3, p 489-492, MayJune 1977. 3 fig, 3 tab, 11 ref.

Descriptors: *Subsurface drainage, *Tile drainage, *Sediments, *Ohio, *Organic soils, Iron, Iron compounds, Iron oxides, Manganese, Aluminum, Organic matter, Soils, Soil texture, Partide size, Hydrogen ion concentration, Sedimenta-tion, Sampling, On-site investigations, Cultivated lands, Drainage, Agriculture. Identifiers: *Willard Marsh(Ohio), Ochre, Ochre formation, Iron sludge.

Sediments in subsurface drainage systems were characterized in cultivated organic soils of the Wil-lard Marsh. On-site inspections of sediment-affected drains were made, and soil permeability to water was measured in the field. Chemical analyses were made on drain sediments and soil for ferrous iron, total iron, manganese, aluminum, organic matter, mineral content, and pH. The permeability of the subsoil was quite low, ranging from 0.1 to 0.4 cm/hr. The plow layer permeability varied from about 1.5 to 2.5 cm/hr. Sediments from drains ranged from 100% organic material to a mixture of organic and mineral materials. A maximum iron content of 35% was found in an ochreous sediment. Ferrous iron in the soil increased markedly below drain depth. Subsurface drainage appears to be impeded by two principle factors: one is the low permeability of the subsoil, and the other factor is the accumulation of organic sediments and ochre (iron) in drains. (Sims-ISWS)

CLOSING, REPLICATE-SAMPLE, SEDI-

MENT TRAP, California Univ., Davis. Div. of Environmental Studies

B. L. Kimmel, R. P. Axler, and C. R. Goldman. Limnology and Oceanography, Vol 22, No 4, p 768-772, July 1977. 3 fig, 2 tab, 13 ref. NSF GB-19052, DEB76-19524.

Descriptors: *Sampling, *Sediments, *Seston, Equipment, Sedimentation, Lakes, On-site investigations, Limnology, Lake sediments. Identifiers: *Sediment traps, Samplers.

A device for collecting sedimenting seston in pelagic systems was described. The device permits remote closure, sample replication, correction for attached growth, and use in vertical series. The data presented indicate a significant amount of horizontal heterogeneity in seston sedimentation within a small lake basin. (Sims-ISWS) W77-11802

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES,

Scripps Institution of Oceanography, La Jolla, Calif. For primary bibliographic entry see Field 2L. W77-11817

CONTROLS OF VARIATION IN SUSPENDED SEDIMENT CONCENTRATION IN THE RIVER ROTHER, WEST SUSSEX, ENGLAND, King's Coll., London (England). Dept. of Geology. For primary bibliographic entry see Field 4D. W77-11824

SEDIMENT CONCENTRATION AND DURA-TION IN STREAM CHANNELS. Denver Univ., Colo. Dept. of Geography. J. E. Costa

Journal of Soil and Water Conservation, Vol 32, No 3, p 168-170, July 1977. 4 fig, 15 ref.

Descriptors: *Sediment transport, *Channels, Streams, *Maryland, Streambeds, Water quality, Groundwater, Hydrographs, Hydrology, Turbidi-ty, Pollutant identification.

Identifiers: *Sediment concentration, Suspended sediment, Flood hydrographs.

Establishment of water quality standards for suspended sediment has been delayed partially by lack of information on sediment persistence in channels. In streams with dominantly suspended sediment loads, suspended sediment concentra-tions can be studied by correlating the concentra-tions with turbidity. In the stream studied, both discharge and sediment concentration increase downstream during floods because of the con-fluence of sediment-laden tributaries. Duration of ed sediment concentrations in channels is reduced by higher rates of preceding flows, in-creased volumes of groundwater, and through-flow contributions to flood hydrographs, multipeaked hydrographs and sediment concentration peaks preceding water discharge peaks. (Lee-ISWS) W77-11825

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTA-TION, Geological

Survey, Tucson, Ariz. Water Resources Div. For primary bibliographic entry see Field 2D. W77-11870

SHORELINE CONFIGURATION SHORELINE DYNAMICS: A MESOSCALE ANALYSIS.

Virginia Univ., Charlottesville. Dept. of Environ-For primary bibliographic entry see Field 2L. W77-11893

CIRCULATION OBSERVATIONS IN BIGHT USING LANDSAT IMAGERY.

Louisiana State Univ., Baton Rouge. Center for Wetland Resources. For primary bibliographic entry see Field 2L.

SPATIAL AND TEMPORAL VARIATIONS IN THE INTERSTITIAL WATER CHEMISTRY OF CHESAPEAKE BAY SEDIMENTS, Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 2L.
W77-11906

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR, Canada Centre for Inland Waters, Burlington

(Ontario). For primary bibliographic entry see Field 5C. W77-12055

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5B. W77-12067 (Ontario).

A NEW METHOD OF COMPUTATION OF THE SUSPENDED SEDIMENT LOAD, Freiburg Univ. (West Germany). Geographisches

K-R. Nippes. In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 659-666, 1974. 3 fig. 2 tab, 9 ref.

Descriptors: *Suspended solids, *Sediment load, *Model studies, Mathematical models, Sediments, Sediment discharge, Erosion, Geomorphology, Mountains, Watersheds(Basins), Rivers, Streams, Floods, Sediment transport.

Until now it was difficult to compute the suspended sediment load. A new method was

Group 2J-Erosion and Sedimentation

shown which needs only a small amount of measured data. A sufficiently precise computation of the suspended sediment load was possible by use of an area parameter. The suspended sediment transport occurs in smaller mountainous watercourses during times of increased discharge. A method was developed which determines the correlative connection between the discharge increase and the maximum suspended sediment concentration during the discharge increases. The method of computation was based on the following demonstrable conditions: (1) There is a close correlative connection between the maximum suspended sediment concentration during a discharge increase and the rate of increase. (2) The suspended sediment load during an increase in discharge can be computed sufficiently precisely as a function of the maximum sediment concentration, the discharge peak, and the time concerned. (3) The suspended sediment concentration is nearly constant during periods without floods. (See also W77-06708) (Sims-ISWS) W77-12098

MATHEMATICAL MODEL OF THE RIVERBED EROSION BELOW A DAM,

Technical Univ. of Krakow (Poland).

H. Witkowska.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 821-830, 1974. 1 fig, 2 tab, 19 ref.

Descriptors: "Erosion, "River beds, "Mathematical models, "Gradually varied flow, Model studies, Bed load, Sediment transport, Mathematical studies, Analytical techniques, Analysis, Sediment load, Flow, Hydrologic aspects, Foreign research, Foreign countries, Profiles, Degredation(Stream), Stream erosion. Identifiers: "Poland, "Upper Vistula River(Poland).

The principles of choosing a mathematical model of river-bed erosion were discussed. According to these principles mathematical models were proposed based on the gradually varied flow equation and on (1) Meyer-Peter, (2) Meyer-Peter-Muller, and (3) Gontcharoff formulas for the bed load. The models were compared with the experimental data for the Upper Vistula River. second model was found to have the best correspondence with measured values. It was concluded that: (1) The choice of mathematical model is determined by the geological, hydrological, and sedimentation characteristics. It cannot general, and every practical use has to be carefully chosen. (2) The bed load formulas are of the greatest importance. Their choice is crucial to the results. (3) Three types of differential equations were derived, and their solutions by the Tinney trial-and-error method were shown. The method allows some basic assumptions to be avoided and allows the inclusion of additional parameters. (4) The final equilibrium equations were derived by the step method. (5) The calculations based on the field data showed that the chosen model gives very good results. It allows a nonregular variation of the x- coordinate of the sediment diameter, d, and varied slope (even with negative values) to be taken into account. (6) The armouring coefficient is not necessary if the final d is properly expressed as a function of x. (See also W77-06708) (Humphreys-ISWS)

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY, Agricultural Research Service, Columbia, Mo.

Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center. For primary bibliographic entry see Field 5G. W77-12149 CALLAHAN RESERVOIR: III. BOTTOM SEDI-MENT-WATER-PHOSPHORUS RELATION-

SHIPS, Agricultural Research Service, Durant, Okla. Water Quality Management Lab. For primary bibliographic entry see Field 5G.

A 96-HOUR SEDIMENT BIOASSAY OF DU-LUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST OR-GANISMS,

Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies Lab.

For primary bibliographic entry see Field 5A. W77-12240

ANALYSIS OF HEAVY METALS AND BAC-TERIA IN SEDIMENTS FROM DANISH LIG-NITE PITS.

Copenhagen Univ. (Denmark). Inst. of Hygiene. For primary bibliographic entry see Field 5A. W77-12250

2K. Chemical Processes

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS.

Delaware Úniv., Newark. For primary bibliographic entry see Field 5B. W77-11524

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES.

San Diego State Univ., Calif. Dept. of Chemistry. For primary bibliographic entry see Field 2C. W77-11586

RADIOACTIVITY IN MISSISSIPPI RIVER WATER,

Louisiana Water Resources Research Inst. Baton Rouge. For primary bibliographic entry see Field 5A. W77-11641

QUANTUM-MECHANICAL STUDIES OF EN-VIRONMENTAL EFFECTS ON BIOMOLECULES: I. HYDRATION OF FORMA-

MIDE, Consiglio Nazionale delle Ricerche, Pisa (Italy). Laboratori di Chimica Quantistica.

G. Alagona, A. Pullman, E. Scrocco, and J. Tomasi.

Int J Peptide Protein Res. 5(4), p 251-259, 1973.

Descriptors: *Environmental effects, *Molecular structure, *Hydration, Chemical properties.
Identifiers: *Formamide, Biomolecules.

As a first step in a general quantum-mechanical investigation of environmental effects on the structure and properties of biomolecules, the non-empirical ab initio self-consistent field molecular orbital method was employed for the determination of the principal hydration sites of formamide and of the essential characteristics of the monohydrates. In view of the extension of the study to more complex systems, the validity of a simplified treatment taking into account only the electrostatic parts of the interaction energy between formamide and water was also investigated.—Copyright 1974, Biological Abstracts, Inc.
W77-11645

EFFECTS OF SODIUM SULFATE AND SODIUM CARBONATE SOLUTIONS ON CHEMICAL AND PHYSICAL PROPERTIES OF A CHER-NOZEM SOIL.

NOZEM SOIL, Department of Agriculture, Vegreville (Alberta). Solonetzic Soil Sub-Station. R. R. Cairns, and I. Szabolcs.

Can J Soil Sci. 53(4), p 399-403, 1973.

Descriptors: *Sodium sulfate, Sodium compounds, Carbonates, Soils, Soil chemistry, *Chernozems, *Soil chemical properties, *Soil physical properties, *Soil physical properties.*

Dilute solutions (0.01 N and 0.1 N) of Na2SO4 and Na2CO3 in comparison with water were allowed to penetrate columns of Chernozem Ah horizon soil, which were then subjected to the penetration of water. Although the Na2SO4 solutions penetrated the soil columns slightly more readily than the Na2CO3 solutions, at equal concentrations they were just as or more effective in dispersing the soil and blocking the subsequent entry of water. Leaching with Na2SO4 caused a downward displacement of Ca.—Copyright 1974, Biological Abstracts, Inc. W77-11650

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71, Direktoratet for Jakt, Viltstell og Ferskvannsfiske, Vollebekk (Norway). Fisheries Research Inst. For primary bibliographic entry see Field 2B. W77-11785

BUDGET OF SELECTED MINERAL NUTRIENTS FOR TWO WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIED-MONT.

Georgia Univ., Athens. Inst. of Natural Resources. For primary bibliographic entry see Field 5B. W77-11791

PRECIPITATION NUTRIENTS IN THE OPEN AND UNDER TWO FORESTS IN MINNESOTA, Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station. E. S. Verry, and D. R. Timmons. Canadian Journal of Forest Research, Vol. 7, No. 1, p 112-119, March, 1977, 1 fig. 7 tab, 17 ref.

Descriptors: *Nutrients,
*Precipitation(Atmospheric), *Minnesota,
*Chemistry of precipitation, Throughfall,
Nitrogen, Potassium, Calcium, Sodium, Magnesium.

Identifiers: Aspen, Black spruce, Nutrient loads, Nutrient inputs.

Concentrations of N, P, K, Ca, Mg, and Na were measured in rain and snow in the open and in throughfall and stemflow under black spruce and aspen forests in north-central Minnesota. Concentrations of total P in rain and black spruce throughfall were inversely related to storm size. Annual precipitation nutrient inputs to the forest floor were calculated for each site. In general, nutrient contributions from snow were less than 10% of the annual nutrient input from precipitation at each site, and differences in snow nutrient input between sites were minimal. Rainfall nutrient input differed significantly between sites. Rain and snow passing through both forest canopies were enriched with nutrients except inorganic nitrogen. Total annual nutrients added to the forest floor under the black space stand averaged 1.7 times that added in the open; the annual amount added under the aspen stand averaged 5.2 times that in the open. (Forest Service) W77-11831

THE DIFFERENTIATION OF INORGANIC AND ORGANOMERCURY SPECIES IN AQUEOUS SAMPLES, North Dakota Univ., Grand Forks. Dept. of

Chemistry.

For primary bibliographic entry see Field 5A. W77-11936

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT

Washington Univ., Seattle, Coll. of Forestry. For primary bibliographic entry see Field 4C. W77-11941

MASS TRANSFER STUDIES IN SORBIN POROUS MEDIA: II. EXPERIMENTAL EVALUATION WITH TRITIUM (3H20), New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-11983

MASS TRANSFER STUDIES IN SORBING POROUS MEDIA: III. EXPERIMENTAL

POROUS MEDIA: III. EXPERIMENTAL EVALUATION WITH 2,4,5-T, New Mexico State Univ., University Park. Dept. of Agronomy

For primary bibliographic entry see Field 2G.

GROUNDWATER CHEMISTRY AND THE TRANSPORT EQUATIONS,

Princeton Univ., N.J. Water Resources Program. For primary bibliographic entry see Field 2F. W77-12112

DENITRIFICATION MEASURED DIRECTLY FROM NITROGEN AND NITROUS OXIDE GAS FLUXES

California Univ., Davis. Dept. of Land, Air and Water Resource

D. E. Rolston, M. Fried, and D. A. Goldhamer. Soil Science Society of America Journal, Vol 40, No 2, p 259-266, March-April 1976. 8 fig, 2 tab, 17

Descriptors: *Denitrification, *Nitrogen, Fertilization, Soils, Soil water, Lysimeters, Diffusion,

Identifiers: Soil columns, Ryegrass, *Nitrogen transport(Soils), *Nitrous oxide.

The amount of denitrification is generally the unknown in attempts to evaluate the fate of N fertilizers applied to soils. Substantial error can result when denitrification is determined from the difference between measurements of plant uptake, residual soil N, leaching, and the amount of N applied. An independent, direct measure of denitrification potentially has merit by containing only the error from direct measurement and not a cur tive error from several measurements. Nitrate at a rate of 300 kg of N/ha and enriched with 20 and 10 rate of 300 kg of N/ha and enriched with 20 and 10 atom percent excess N-15 was applied to laboratory columns and a field plot, respectively. The columns were maintained at soilwater pressure heads of -22 and -70 cm. The field plot was maintained at a soil -water pressure head of approximately -10 cm in the upper 10 cm of soil. The field plot was cropped with perennial ryegrass. The columns and field plot were instrumented with tensiometers, soil solution samplers, and gas samplers. The concentration and isotopic ratio of N03, N2, and N20 were measured as a function of soil depth and time. The gaseous concentration depth and time. The gaseous concentration gradients and measured apparent diffusion coefficients were used to calculate the fluxes of (N-15) 2 and (N-15)20 gas from the soil. Residual soil N, plant uptake, and leaching were measured in order to calculate dentirification determined directly compared favorably with that determined by difference. (Skogerboe-Colorado State)

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oı es DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS, Life Systems, Inc., Cleveland, Ohio. For primary bibliographic entry see Field 5A. W77-12199

2L. Estuaries

DAILY VERTICAL DISTRIBUTION OF ZOOPLANKTON IN SOME LAKES IN THE EASTERN PART OF THE BOL'SHEZEMEL'SKAYA TUNDRA (IN RUS-

Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab. N. V. Vekhov.

Biol Nauki 18(12), p 29-36, 1975.

Descriptors: *Spatial distribution, *Zooplankton, *Tundra, Daphnia, Lakes, Light, Oxygen, Plankton. Temperature.

Identifiers: Bol'shezmel'skaya, Chydorus-sphaericus, Colotheca-mutabilis Colotheca-mutabilis, Concernius-unicorina, Cyclops-strenuus, Daphnia-longiremis, Daphnia-longispina, Euchlanis-dilatata, Eudiaptomusgraciloides, Heterocope-appendiculata, Heterocope-gibberum, Kellicottia-longispina, LICO Conochilus-unicornis, Keratella-cochlearis, Leptodora-kindtii, Polyarthra-dolichoptera, Russian-SFSR.

Studies in 2 tundra lakes (maximum depth: 6.5 m) NW of Vorkuta (Russian SFSR, USSR) showed that plankters migrated in vertical direction and that specific plankton distribution, which was most dense in upper 2 m, remained unchanged even with strong winds. Daily migration and dis-tribution depended on food concentration, temtribution depended on food concentration, temperature, light intensity and O2 supply. The following rotifers, copepods and Cladocera were found: Asplanchas priodonta Gosse, Kellicotta longispina (Kellicott), Keratella cochlearis (Gosse), Synchaeta pectinata Ehrenberg, Polyarthra dolichoptera Idelson, Conochilus unicornis Rousselet, Colotheca mutabilis (Hudson), Leptodora kindtii (Focke), Daphnia Longiremis Sars, Chydorus sphaericus (O.F. Longiremis Sars, Chydorus sphaericus (O.F. Mueller), Daphnia longispina (O.F. Mueller, Eu-diaptomus graciloides Lillieborg, Heterocope appendiculata Sars, Cyclops strenus Fischer, Euchlanis dilatata dilatata Ehrenberg and Heterocope gibberum.-Copyright 1977, Biological Abstracts, Inc. W77-11501

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND GER-MAN BIGHT, (IN GERMAN),

Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5A.
W77-11520

W77-11525

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE,

Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept. For primary bibliographic entry see Field 5C. W77-11521

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA, Swedish Water and Air Pollution Research Lab., Goteborg. For primary bibliographic entry see Field 5C.

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC, Kanazawa Univ. Japan). Radiochemistry Lab.

For primary bibliographic entry see Field 5A.

VITAMIN B12 CONTENTS IN SEA WATER ALONG THE COAST OF FUKUYAMA IN 1970

AND 1971, Hiroshima Univ. (Japan). Dept. of Fisheries. For primary bibliographic entry see Field 5C. W77-11535

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY. Bath Univ. (England). For primary bibliographic entry see Field 5C. W77-11537

ALUMINUM-26 IN DEEP-SEA SEDIMENT, Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioac-

For primary bibliographic entry see Field 5B. W77-11538

VIBRIO PARAHAEMOLYTICUS - A MARINE PATHOGEN DETECTED IN SOUTH AFRICAN COASTAL WATERS, South African Inst. for Medical Research, Port

Elizabeth.

For primary bibliographic entry see Field 5C. W77-11553

NOTES ON THE CONSERVATION OF UMN-GAZANA ESTUARY,

Cape Town Univ. (South Africa). Dept. of Zoolo-

South African Journal of Science, Vol 72, No 12, p 363-364. December 1976.

Descriptors: Conservation, Limnology, Man-groves, Swamps, Saline lakes, Ecology, Inver-tebrates, Water birds, Fish, Silting, Phytoplankton, Estuarine environment, Water quality. Identifiers: Zostera, Upogebia, Scylla, Mugilidae, Umngazana River, Transkei, Southern Africa.

The Transkei coastline comprises a 290 km long mosaic of forest, grassland and estuaries. Much of the area has been denuded by shifting agriculture, veld burning, overgrazing and erosion. Many estuaries are degraded due to a heavy silt load. With increased development, further pressures will be placed on the coastline, and there is an urgent need to develop a masterplan for future township development, tourism, industry and conservation. The present report is a contribution towards this and presents the case for conservation of the Umngazana Estuary. Physical data indicate a stable and equable habitat suitable for long-term conservation. A perennially open mouth, freedom from silting, normal salinities, high oxygen tensions and considerable tidal flush-ing all contribute towards ideal estuarine conditions. The flora include the southern-most congregation of three mangrove species, forming the largest mangrove forests in Southern Africa. Salt marshes are the major primary producers of the system. Rich forests on the surrounding hills prevent erosion and silting. A rich invertebrate fauna of 140 species was recorded. 39 species of fish were netted, and 103 bird species were recorded in winter. The proclamation of the area as a nature reserve is urgently recommended. (So African Water Info Center) W77-11563

BREAKING WAVE CRITERION ON A SLOP-ING BEACH, Naval Postgraduate School, Monterey, Calif.

For primary bibliographic entry see Field 8B. W77-11585

Group 2L—Estuaries

OCEAN TIDES AND WEATHER-INDUCED BOTTOM PRESSURE FLUCTUATIONS IN THE

MIDDLE-ATLANTIC BIGHT,
Woods Hole Oceanographic Institution, Mass.
R. C. Beardsley, H. Mofjeld, M. Wimbush, C. N.
Flagg, and J. A. Vermersch, Jr.

Journal of Geophysical Research, Vol. 82, No. 21, p 3175-3182, July 20, 1977. 5 fig, 3 tab, 15 ref. NOAA 01-5-022-471, NSF GA-41075, DES74-03001, OCE76-01813.

Descriptors: *Oceans, *Tides, *Pressure, *Atlantic Ocean, Weather, Storms, Winds, Instruentation, Fluctuations, Waves, Ocean waves, On-site investigations, Data processing, Frequency analysis, Frequency curves, Oceanography. Identifiers: *Middle-Atlantic Bight, *Bottom pressure, Subtidal pressure fluctuations

Five bottom pressure gages were deployed in the Middle-Atlantic Bight during late winter of 1974. Analysis of the resulting pressure series and Analysis of the resulting pressure series showed that tides are the dominant pressure signal in this section of the continental shelf. Most of the remaining pressure fluctuations appear to be forced by meteorological transients. During March 21, 1974, a developing cyclone moving up the coast excited a coherent group of sea level oscillations with characteristic periods of 5-7 hours, which were interpreted here as coastal-trapped edge waves. Spectra of the nontidal pressure series are red, however; most of the nontidal variability is caused by lower-frequency (subtidal) components. The subsurface pressure (SSP) fluctuations do appear coherent over the spatial extent of the array in the most energetic subtidal frequency bands, and estimates made of the relative horizontal SSP gradients indicated that cross-shelf gradient variations are significantly larger than alongshore gradient variations. Some consequences of the large weather-induced gradient fluctuations on the shelf circulation were discussed. (Sims-ISWS) W77-11610

FEEDING ECOLOGY OF EELGRASS FISH COMMUNITIES,

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

For primary bibliographic entry see Field 5C. W77-11644

TIDE PRINTS: SURFACE TIDAL CURRENTS IN PUGET SOUND,

Washington Univ., Seattle, Div. of Marine Resources.

N. McGary, and J. H. Lincoln. Sea Grant Report No. WSG-77-1, 1977. 51 p. 2 ref. Also Published by Univ. Washington Press, Seat-

Descriptors: *Tides, *Estuaries, Washington. Identifiers: *Surface currents, *Tidal currents, *Puget Sound(Wash), Tidal charts.

These charts-or 'tide prints'-portray the surface currents in Puget Sound at eight stages during a tidal day and all are referenced to the tide stage at Seattle. Absolute or true speeds are not shown because of the strong dependence of currents on tide range and height, although the portrayal is designed to indicate approximate relative speeds are not shown because of the strong dependence of currents on tide range and height, although the portrayal is designed to indicate approximate rela-tive speeds and flow directions. These charts are intended to supplement the Tidal Current Charts of Puget Sound and the Tidal Current tables published by the National Ocean Survey of the National Oceanic and Atmospheric Administration. (NOAA)

OBSERVATIONS OF CRASSOSTREA VIRGINICA CULTURED IN THE HEATED EF-

DISCHARGED FLUENT AND RADIONUCLIDES OF A NUCLEAR POWER

REACTOR, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 5C.

W77-11655

GUIDEBOOK TO GEOLOGIC AND BEACH FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. V. T. King, and B. W. Nelson. Maine Sea Grant Bulletin No. 10, 1977. 18 p. 11 fig,

6 ref.

*Geology, Descriptors: *Maine, *Ponds, Identifiers: *Salt ponds, *New Harbor(Maine).

The Rachel Carson Salt Pond Preserve is managed by the Maine Chapter of the Nature Conservancy. This organization is concerned with the preservaof unique or essential natural featu Salt Pond area is a particularly good area for view-ing certain geologic features. The rocks are well exposed and many features are duplicated along a proposed excursion route. The length of the route is about 1,170 feet (approximately 357 meters) on the north side of the Salt Pond. Total time of the field trip is a minimum of 60-75 minutes. Photographs are provided of each suggested stop. These photographs allow you to find key geological fea-tures with minimum delay. At the end of each numbered descriptive paragraph, the distance from the Rachel Carson monument is given in meters and feet. A glossary of terms is provided. (NOAA) W77-11656

A PRELIMINARY OCEANOGRAPHIC SURVEY OF THE DAMARISCOTTA RIVER ESTUARY,

LINCOLN COUNTY, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 5B. W77-11657

ANNUAL PHYSICAL AND CHEMICAL OCEANOGRAPHIC CYCLES OF AUKE BAY, SOUTHEASTERN ALASKA,

National Marine Fisheries Service, Seattle. H. E. Bruce, D. R. McLain, and L. Wing. For sale by Superintendent of Documents, U.S. Govt Printing Office, Washington, DC 20402. NOAA Technical Report NMFS SSRF-712, May 1977. 14 p, 16 fig, 1 tab, 25 ref.

Descriptors: *Oceanography, *Nutrients. *Estuaries, *Alaska.
Identifiers: *Physical oceanography, *Chemical oceanography, Annual cycles.

The annual cycles of physical and chemical oceanographic conditions in Auke Bay, a small oceanographic conditions in Aute Bay, a simal estuary in southeastern Alaska, showed a consistent pattern over an 8-yr period (1961-68). The cycles closely followed see and climatological and atmospheric events. Increased insolation in the spring caused general warming of the surface water and the air, which in turn increased the freshwater input into Auke Bay from melting snow and ice. The fresh water lowered surface salinities and together with warming of the surface waters caused a density stratification of the water column, which increased as the spring-summer season progressed. Maximum stratification occured in August, follwed by a general decay of stratification in September. Vertical mixing of the top 30 m of the water column by fall storms in September and colling of surface water resulting from decreased insolation set up a thermohaline circula-tion that continued through the fall and early winter. The water column became homogeneous

by January and remained throughly mixed from by January and remained throughly mixed from January through March or early April. Auke Bay was rich in the inorganic nutrients phosphate, sil-icate, and nitrate. Spring phytoplankton blooms followed the onset of stratification and drastically reduced the concentration of all three nutrients in the surface water. Nitrate was essentially depleted and remained so throughout the summer. Low nitrate availability was undoubtedly one of the im-portant factors limiting primary production in portant factors lim Auke Bay. (NOAA) W77-11658

NEW ENGLAND OFFSHORE MINING EN-VIRONMENTAL STUDY (PROJECT NOMES), National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs

NOAA Special Report, April 1977. 152 p, 57 fig, 30 tab, 95 ref, 4 append. John W. Padan (Ed.).

Descriptors: *Environmental effects, *Dredging, Resource development, Baseline studies, Mining, Sands, Gravels, New England. Identifiers: Outer Continental Shelf, Project NOMES, Hydraulic dredging, Environmental im-

Findings of a study, established to investigate the potential hazard to the environment of offshore sand and gravel mining but prematurely terminated, are presented as a baseline for further studies. Included are the determination of the kinds of environmental impacts likely to result from hydraulic dredging; a research strategy to measure such impacts; and specific investigations to implement that strategy in four oceanographic aspects-biological (benthos, phytoplankton, turbidity experiments), geological (bathmetry, stratigraphy, core samples), chemical (nutrients, suspended solids), and physical (temperature and salinity, currents and dispersion, and light penetration). Detailed findings of completed studies are presented. Appendices provide a description of the complete process of offshore mining, from exploration to transportation to market; lists of Project NOMES Advisory Committees; and baseline data regarding benthic communities. (NOAA) W77-11660

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN.

National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office. For primary bibliographic entry see Field 5B. W77-11661

INTERNAL SEDIMENTARY STRUCTURES, VERTICAL STRATIGRAPHIC SEQUENCES, VERTICAL STRATIGRAPHIC SEQUENCES, AND GRAIN-SIZE PARAMETER VARIATIONS IN A TPANSCEPPER VARIATIONS IN A TRANSGRESSIVE COASTAL BARRIER COMPLEX: THE ATLANTIC COAST OF

DELAWARE, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 2J. W77-11663

CONCRETE PROPERTIES AT OCEAN DEPTHS. Civil Engineering Lab. (Navy), Port Hueneme, Calif. Ocean Structures Div. For primary bibliographic entry see Field 8F.

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W77-11779

SOME REMARKS ON COMPUTER MODELING

OF COASTAL FLOWS, California Univ., Berkeley. Dept. of Civil En-

Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the Amer-

ican Society of Civil Engineers, Vol 102, No. WW4, p 395-406, November 1976. 6 fig, 29 ref.

Descriptors: *Coastal engineering, *Estuaries, *Dispersion, *Computer models, *Simulation analysis, Currents(Water), Mass transfer, Momentum transfer, Tidal waters, Equations, Systems analysis, Velocity, California. Identifiers: Computation, Transport model.

Limitations on the ability of numerical models to model flow and dispersion of pollutants in coastal areas due to fundamental restriction in knowledge of exchange coefficients are covered. Specific limitations result from the effects of stratification on the control of flow and mixing rates, and form a lack of understanding of the transverse exchange process. Examples of specific computer models are given, with emphasis on why some models give reliable results despite the limitations previously mentioned. (Bell-Cornell)

INCOMPLETE EXTRACTION OF RAPIDLY SETTLING PARTICLES FROM WATER SAM-

Woods Hole Oceanographic Inst., Mass. Joint Proram in Oceanography. W. D. Gardner.

Limnology and Oceanography, Vol 22, No 4, p 764-768, July 1977. 3 fig, 2 tab, 6 ref.

Descriptors: *Sampling, *Particle size, *Oceans, *Lakes, Equipment, Water sampling, On-site investigations, Settling velocity, Filtration, Limnology, Oceanography.
Identifiers: Niskin bottles, Particle concentration,

Sampling techniques.

Many particles captured in water bottles settle below the sampling spigots and escape detection when the sampler design does not allow for removal of all the enclosed water. Particles lost from 30-liter Niskin bottles can increase the measured total concentration of particulate matter by a factor of 1.1-1.7 in open ocean samples. Large bers of particles as small as 4 micrometers are lost. Scanning electron microscopy showed a significant loss of diatoms, Acantharia, Foraminifera, coccospheres, dinoflagellates, fecal pellets, organic matter, carapaces, and aggregates of particles. (Sims-ISWS)
W77-11801

ON THE VARIABILITY OF SURFACE TEN-

SION WITH MEAN WIND SPEED, Hamburg Univ. (West Germany). Institut fuer Organische Chemie und Biochemie. H. Huhnerfuss, W. Walter, and G. Krusp

Journal of Physical Oceanography, Vol 7, No 4, p 567-571, July 1977. 3 fig, 5 tab, 25 ref.

Descriptors: *Surface tension, *Winds, *Oceans, *Monomolecular films, *Atlantic Ocean, On-site investigations, One-site data collections, Ships, Foreign research, Biological communities, Plankton, Temporal distribution, Oceanography. Identifiers: *North Sea, Slicks, Organic films, Biological productivity.

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In situ measurements of surface tension obtained by R. V. Gauss under coastal (North Sea off the Island of Sylt) and by R. V. Meteor under open sea conditions (GATE area) were compared with time variations of the surface mean wind speed. The results indicated that the surface tension of the sea surface may attain values which are 21 dyn/cm below the values obtained from the Fleming-Revelle formula, if the mean wind speed decreases steadily to less than 5 m/s and the biological productivity within the upper layers of the water is significant. (Sims-ISWS) W77-11807

OCEAN SURFACE DRIFT VELOCITIES.

Cooperative Inst. for Marine and Atmospheric Studies, Miami, Fla.

Journal of Physical Oceanography, Vol 7, No 4, p 606-609, July 1977. 4 ref. NSF ATM75-22940.

Descriptors: *Aquatic drift, *Oceans, *Ocean circulation, *Model studies, Mathematical models, Oil spills, Air-water interfaces, Pressure, Coriolis force, Ocean currents, Velocity, Oceanography. Identifiers: *Drift velocities.

Symmetry considerations indicate that in steadystate conditions, and in the absence of a sea cur-rent, a horizontal interface must move in the direction of the surface geostrophic wind. With currents present, the interface velocity is the vector mean of the surface geostrophic wind and the current velocity, weighted respectively by the fluid masses per unit surface area which are af-fected by the viscous diffusion of vorticity upward and downward from the interface. In turbulent flow with neutral stratification, the ratio of the masses equals the square root of the density ratio. In transient conditions, the surface drift velocity has components in the direction of the isallobaric gradient and down a steeping surface slope. Wave action is responsible mainly for the spreading and the breakup of surface films. (Sims-ISWS) W77-11810

CIRCULATION AND TEMPERATURE STRUC-TURE IN LARGE MARINE ENCLOSURES, Marine Lab., Aberdeen (Scotland).

J. H. Steele, D. M. Farmer, and E. W. Henderson. Journal of the Fisheries Research Board of Canada, Vol 34, No 8, p 1095-1104, August 1977. 14 fig, 18 ref. NSF OCE73-09763 A04.

Descriptors: *Water circulation, *Water tempera-ture, *Dye dispersion, Mixing, Dye releases, Fluorescent dye, Dye concentrations, Circulation, Temperature, On-site investigations, Phytoplank-ton, Algae, Chlorophyll, Oceanography, Estua-

Identifiers: *Marine enclosures.

Certain physical measurements intended to shed light on the circulation in large plastic enclosures (60-2000 cu m) induced by the changing environment in which they are moored were described. Layers of dye generally were seen to diffuse vertically, although some important advection effects also were observed. Estimates of an average coef-ficient of turbulent diffusivity yielded values in the range .05-.26 sq m/s. Measurements taken with recording thermistor chains both inside and outside the enclosures showed strong damping of ex-ternal fluctuations with periods significantly less than 1 day. Various possible sources of mixing energy were considered, and it was concluded that thermal forcing through the wall may be signifi-cant and could account for the observed range of coefficients. The significance of the observed mixing and circulation to the ecology of the enclosures was discussed. Of particular importance is the vertical mixing of nutrients that influences phytoplankton sinking rates and thus plays a crucial role in determining variations in algal concentration at different depths. (Sims-ISWS) W77-11816

SEDIMENTATION AND CLIMATIC PATTERNS IN THE SANTA BARBARA BASIN DURING THE 19TH AND 20TH CENTURIES,

Scripps Institution of Oceanography, La Jolla, Calif.

Cain.
A. Soutar, and P. A. Crill.
Geological Society of American Bulletin, Vol 88,
No 8, p 1161-1172, August 1977. 12 fig, 11 tab, 36
ref. NSF GA-40157.

Descriptors: *Sedimentation, *Climatology, *Dendrochonology, *Basins, *California, Rainfall, Sediments, Sedimentology, Documentation,

Climates, Cores, Sampling, Varves, Histograms, Time lag, Analysis, Evaluation, Data collections, Deposition(Sediments), Correlation analysis, Temperature, Seasonal, Analytical techniques, Regression analysis, Statistical methods. Identifiers: "Santa Barbara Basin(Calif), Climatic

The thickness of annual sediment laminations in the Santa Barbara Basin was compared to southern California drought-resistant tree growth and to regional indices of rainfall and temperature.

The rate of sedimentation was found to be independent of temperature, but it is highly correlated with rainfall and tree growth. It was suggested that sedimentation, like tree growth, is a function of seamentation, like tree growth, is a function of the amount of rainfall in the prior seasons as well as in the current season. The natural filter dis-played by the sedimentation and tree-growth records can be described by a simple mathematical model, which, in the case of sedimentation, can be model, which, in the case of sedimentation, can be related to upstream aggradation or to distributional processes on the shelf. The pair of laminae that constitute a single year's sediment accumulation are related directly. This suggests that the process of detrital sediment delay and redistribution operates primarily in the marine environment. The density difference that distinguishes 'winter' laminae and 'summer' laminae was ascribed to the interaction of the seasonal rate of deposition and the growth of a mat-forming organism endemic to the surface sediment of the Santa Barbara Basin. (Humphreys-ISWS) W77-11817

THE APPLICATION OF NONSTRUCTURAL MEASURES TO COASTAL FLOODING,

Cheney, Miller, Ellis, and Associates, Inc., Putnam, Conn.

nam, Conn.
P. B. Cheney, and H. C. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 750,
Price codes: A05 in paper copy, A01 in microfiche.
Prepared for the New England River Basins Commission, Boston, Mass., Report NERB-30, June 30, 1975. 84 p, 8 tab, 8 plates, 14 ref.

*Non-structural *Institutional constraints, *Coasts, *Flooding, Relocation, Floodproofing, Warning systems, Flood plain insurance, Planning, Building codes, Flood forecasting, Ease-

Identifiers: *Coastal management, *Coastal flooding, "National Flood Insurance Program, Fee sim-ple acquisition, Subdivision regulation, Dune pro-tection, Tax incentives, Encroachment lines, Na-tional Coastal Zone Management Act.

Major flood losses occur in New England that are associated with coastal flooding rather than riverine flooding. The adequacy for coastal flood control of nonstructural measures and the conceptual approach formulated in the Connecticut River Basin Flood Management Study are assessed. The study area includes Westerly, Rhode Island, and Stonington, Connecticut. The study contains a description of the conceptual framework for few description of the conceptual framework for for-mulating nonstructural plans for coastal flood plains, a description of the situation in the communities studied, and a discussion of the application of nonstructural measures to this specific area. The study concludes that: nonstructural approaches often have no structural substitute on the coast; people who can afford coastal property are often willing to take the risk of flood losses; in the coastal zone, it is essential that flood plain management take place in the context of comprehensive planning; although the National Flood Insurance Program is working counter to good flood plain management in certain cases, it can be a prime in developing effective coastal flood plain plain regulations in Connecticut and Rhode Island has been hampered by staffing limits. Thus economic pressures often influence decisions. Ex-amples of unwise beach development are cited. (Nessa-NC)

Group 2L—Estuaries

W77-11852

CAPACITY: A BASIS FOR CARRYING COASTAL PLANNING. North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6B. W77-11853

THE CALIFORNIA COASTAL PLAN: A CRITIQUE, Institute for Contemporary Studies, San Francisco, Calif. For primary bibliographic entry see Field 6B.

FLOOD-PRONE AREAS AND LAND-USE PLANNING--SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION, CALIFORNIA, Geological Survey, Menlo Park, Calif. Water

Georgical Survey, Menio Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif. For primary bibliographic entry see Field 4A.

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAR DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,
American Univ., Washington, D. C. Dept. of
Biology; and Geological Survey, Reston Va. Water Resources Div. For primary bibliographic entry see Field 7B. W77-11874

NUTRIENTS IN THE NEUSE RIVER ESTUARY. North Carolina State Univ. at Raleigh. Dept. of Zoology.

For primary bibliographic entry see Field 5C. W77-11886

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL NORTHEAST GULF OF ALASKA. National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Lahe

For primary bibliographic entry see Field 6G.

SOCIAL COST OF OIL POLLUTION, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 5G. W77-11892

CONFIGURATION SHORELINE DYNAMICS: A MESOSCALE SHORELINE ANALYSIS,

Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. P. Hayden, and J. E. Heywood.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as N75-21633, Price codes: A02 in paper copy, A01 in microfiche. Report to the National Aeronautics and Space Ad-ministration, 1976. 23 p, 7 fig, 13 ref. NAS5-20999.

Descriptors: *Barrier islands, *Beaches, *Erosion, *Deposition, Shores, North Carolina, Storm surge.
Identifiers: *Coastal processes, *Shoreline con-

Atlantic coast barrier-island shorelines are seldom straight, but rather sinuous in plan view. These shoreline curvatures range in size from cusps to capes. Significant relationships exist between the orientation of shoreline segments within the larger of these sinuous features (10 to 15 km between

apexes) and shoreline dynamics, with coefficients ranging up to .9. Orientation of the shoreline segments of Assateague Island (60 km) and the Outer Banks of North Carolina (130 km) was measured from LANDSAT II imagery (1:80,000) and high-altitude aerial photography (1:120,000). Longterm trends in shoreline dynamics were established by mapping shoreline and storm-surge penetration changes from historical aerial photography spanning four decades. (Sinha - OEIS) W77-11893

CIRCULATION OBSERVATIONS IN THE LOUISIANA BIGHT USING LANDSAT LOUISIANA

Louisiana State Univ., Baton Rouge. Center for Wetland Resources

L. J. Rouse, and J. M. Coleman.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as AD-A027 731, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 215, Reprinted from: Remote Sensing of Environment, Vol 5, p 55-66, 1976. 7 fig, 1 tab, 21 ref. N00014-75-C-0192.

Descriptors: *Louisiana, *Circulation, *Turbidity, *Baseline studies, *Resources development, Suspended load.

Identifiers: *Outer Continental Shelf, Radiance, Coastal processes, Environmental conditions,

A method for quantifying the turbidity of offshore water masses using LANDSAT imagery is discussed and the results of a laboratory experiment correlating radiance with concentrations of suspended Mississippi River sediment are presented. The results of the experiment are used to plot suspended sediment contours on eight LANDSAT images of the Louisiana Bight. these contours are observed to depend on the speed and direction of the wind as well as the amount of fresh water discharged by the Mississippi River. The presence of a clockwise circulation in the bight is also indicated by the contours. (Sinha -OEIS) W77-11895

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labs. For primary bibliographic entry see Field 5B.

W77-11896

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVER-

North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning. For primary bibliographic entry see Field 6G.

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME II: APPEN-

North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies. For primary bibliographic entry see Field 6G. W77-11898

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER -DECEMBER, 1975. INTERPRETATIONS, Alabama Development Office, Montgome For primary bibliographic entry see Field 6E.

A STUDY ON THE EFFECTS OF MAIN-TENANCE DREDGING ON SELECTED ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI. Water and Air Research, Inc., Gainesville, Fla.

For primary bibliographic entry see Field 5C. W77-11901

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS,

Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,

Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5C. W77-11903

TIDE AND FAIR-WEATHER WIND EFFECTS IN A BAR-BUILT LOUISIANA ESTUARY, Louisiana State Univ., Baton Rouge. Center for Wetland Resources. B. Kjerfve.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD/A-031 552, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 222, December 1976. Reprinted from: Estuarine Research, Vol II, Geology and Engineering, 1975. 17 p, 8 fig, 26 ref. N00014-69-A-0211-0003.

Descriptors: *Tides, *Wind pressure, *Water levels, *Estuaries, *Louisiana, Coasts.
Identifiers: *Wind effects.

An in-depth, fair-weather field study in July 1972 provided information about the response of the water level of Caminada Bay, an extremely shallow bar-built Louisiana estuary. the water surface elevation was recorded at three locations in the bay along the other parameters, an equipotential surface was established, and the time-dependent variations of a slope vector along the surface gradient were computed. It was found that the in-stantaneous fair-weather wind stress induced a slowly oscillating set-up around a time-averaged slope magnitude. This constituted less than 50% of the measured time-averaged slope. The remaining time-averaged slope is accounted for by tidal nonlinearities. The instantaneous slope vector was found to rotate or oscillate in the horizontal plane with a diurnal period. Tidal input through two en-trances governed this behavior, while the wind stress and atmospheric pressure gradients served only to modify the direction of the surface slope. In general, on the diurnal scale, tidal rather than wind effects dominate the dynamics of Caminada Bay. However, the mean water level responded to the wind direction on a time-scale longer than one day. Wind parallel rather than normal to the coast controlled the water elevation, indicating an Ekman effect. (Sinha-OEIS) W77-11904

SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE, Baird-Atomic, Inc., Bedford, Mass. Government Systems Div. For primary bibliographic entry see Field 5A. W77-11905

SPATIAL AND TEMPORAL VARIATIONS IN THE INTERSTITIAL WATER CHEMISTRY OF CHESAPEAKE BAY SEDIMENTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of
Earth and Planetary Sciences. G. Matisoff, O. P. Bricker, III, G. R. Holdren, Jr.,

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as COO-327918, Price codes: A02 in paper copy, A01 in microfiche. Report to AEC, CONF-750410-7. (1975) 16 p, 16 fig, 1 tab, 24 ref. AEC - AT(11-1)-

Descriptors: *Chesapeake Bay, *Sediments, *Estuarine environment. Identifiers: *Interstitial water, Temporal varia-

tions, Spatial variations, Mass balance.

The calculation of chemical mass balance relations in an estuarine environment requires a careful evaluation of the material fluxes within the sediment and across the sediment-water interface. The rapid response of the estuarine environment to variations in temperature, salinity and sediment deposition rates makes this type of assessment very difficult. One approach is to examine the integrated results of these effects in terms of the spatial and temporal variability of the concentra tions of dissolved species in the sediment. Spatial variations define the limits which may be placed upon the instantaneous concentrations of chemical species as a function of location. Temporal variations interpreted within the framework of the spatial limits may be used to assess the long-term effects of temperature, salinity and sediment deposition rates, thus enabling the more accurate calculations of chemical fluxes. (Sinha-OEIS) W77-11906

ORGANOCHLORINES AND HEAVY METALS IN THE HARBOUR SEAL PHOCASVITULINA FROM THE GERMAN NORTH SEA COAST, Kiel Univ. (West Germany). Institut fuer Haustierkunde.

For primary bibliographic entry see Field 5C. W77-12015

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ABNORMAL TERNS, SICK SEA AND SHORE BIRDS, ORGANOCHLORINES AND BOVIRUSES IN THE INDIAN OCEAN, Aberdeen Univ. (Scotland), Seabird Groun For primary bibliographic entry see Field 5C. W77-12034

CHLORINATED COOLING WATERS IN THE MARINE ENVIRONMENT: DEVELOPMENT OF

EFFLUENT GUIDELINES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 5G. W77-12036

POWER PLANTS AND PLANKTON, Scripps Institution of Oceanography, La Jolla, Calif

For primary bibliographic entry see Field 5C. W77-12039

LONG-TERM FLUCTUATIONS EPIBENTHIC FISH AND INVERTEBRATE POPULATIONS IN APALACHICOLA BAY,

Florida State Univ., Fla. Dept. of Biological Science.

For primary bibliographic entry see Field 5C. W77-12053

A NOTE ON TOXAPHENE IN ENVIRONMEN-TAL SAMPLES FROM THE CHESAPEAKE BAY REGION, Westinghouse Ocean Research Lab., Annapolis,

For primary bibliographic entry see Field 5B. W77-12062

OBSERVATIONS ON THE FISH FAUNA AS-SOCIATED WITH OFFSHORE PLATFORMS IN THE NORTHEASTERN GULF OF MEXICO, College of South Jersey, Camden. Dept. of Biolo-

gy. R. W. Hastings, L. H. Ogren, and M. T. Mabry. Fishery Bulletin, Vol. 74, No. 2, p. 387-402, 1976. 4

Descriptors: *Seasonal, *Biorhythms, *Diurnal, *Nocturnal, Animal groupings, *Fish migration, Offshore platforms, *Diel migration, *Gulf of Mexico, Thermal stratification, Aquatic popula-tions, Fish populations, Coastal structures, Water temperature, Habitats, Aquatic habitats, Florida. Identifiers: *Pelagic environment, *Faunal composition, Artificial reef habitat.

The fish fauna associated with two U.S. Navy research platforms was studied at irregular intervals from 1970 to 1974. Such platforms function as artificial reef habitats and support diverse and abundant fish populations not normally characteristic of the open sandy bottoms in the area. A total of 101 taxa (identified to family or species) was recorded at the two platforms. The greater number of species recorded at the shallower location may be more a result of the greater number of observations made there than of differences in the two habitats. The number of species present at the platforms varies considerably at different times of the day and year. Species numbers are greatest during the summer and fall, but many species begin to move offshore or southward as the water temperature drops, and only about 50-60% of those recorded at the platform remain in December. Major species occupying the platform habitats include fishes usually characteristic of pelagic, inshore (coastal or estuarine), and rocky reef environments. For some of the species, the platform provides food and shelter, while for others, it only offers shelter. Some species may be present only to feed on the numerous fishes and other organisms concentrated there. Diel rhythms of activity are obvious for many of the fishes. W77-12072

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION, University Coll., Dublin (Ireland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B. W77-12109

INFLUENCE OF VARIOUS CONCENTRATIONS OF ORTHOPHOSPHATE ON THE DIVISION RATE OF AN ESTUARINE BENTHIC DIATOM, NAVICULA ARENARIA, IN CULTURE, Groningen Rijksuniversiteit (Netherlands). Dept. of Systematic Biology.

For primary bibliographic entry see Field 5C. W77.12186.

W77-12186

MACROFAUNAL. DYNAMICS. BENTHIC PRODUCTION, AND DISPERSION IN AN OXYGEN-DEFICIENT ESTUARY OF WEST SWEDEN, Swedish Water and Air Pollution Research Lab.,

Gothenberg. For primary bibliographic entry see Field 5C. W77-12216

THE EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SUR-VIVAL AND BEHAVIOR OF COASTAL AND OCEANIC ZOOPLANKTON,

Texas Univ. at Austin, Port Aransas. Marine Science Lab. For primary bibliographic entry see Field 5C. W77-12227

RESIDUES OF CHLORINATED HYDROCAR-BONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS, Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5B.
W77-12229

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES OF THE NORTHERN GULF OF MEXICO. I. SUBCUTANEOUS TU-MORS, PROBABLY FIBROSARCOMAS, IN THE STRIPED MULLET, MUGIL CEPHALUS, Air Force Medical Center Keesler, Keesler AFB, Miss.

For primary bibliographic entry see Field 5C. W77-12236

MERCURY IN THE SESTON OF THE SAN FRANCISCO BAY ESTUARY, Moss Landing Marine Labs., Calif. For primary bibliographic entry see Field 5C. W77-12238

NEW YORK'S MARINE FISHERIES: CHANG-ING NEEDS IN A CHANGING ENVIRONMENT, New York State Dept. of Environmental Conservation, Stony Brook. Div. of Marine and Coastal For primary bibliographic entry see Field 6B. W77-12247

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SYSTEMS FOR SOLAR DISTILLATION, MacDonald Coll., Montreal (Quebec). Brace Research Inst. T. A. Lawand. Annals of Arid Zone, Vol 15, No 3, p 177-205, September, 1976. 18 fig, 1 tab, 15 ref.

Descriptors: *Solar distillation, *Distillation apparatus, *Distillation processes, *Solar radiation, *Solar stills, Equipment, Distillation, Costs, Saline water, Salinity, Water purification, Water treatment, Desalination plants, Saline water systems, Water sources.

The history of solar distillation is traced and evalu-The history of solar distillation is traced and evaluated, and the experiences with operating solar stills presented. A list of the most important solar distillation plants throughout the world is given, and a review of some research on solar distillation is presented. Improvements are constantly being made which hopefully will reduce the costs and increase the productivity of solar stills. The Manual of Solar Distillation of Saline Water, the most complete document to date describing the different solar stills which have been built to date in various parts of the world, is described. The materials used in the construction of solar distillamaterials used in the construction of solar distillation systems are described in detail and evaluated, and a procedure for estimating costs is presented.
The advantages of solar distillation presented include: (1) units can be built from easily available material; (2) the local labor force can undertake all the principle jobs in the construction, installation operation, and maintenance of the system; and (3) apart from the amortization of the capital investment, the cost of the operation is not high. (Jamail-Arizona) W77-11618

THIN CELL ELECTROMEMBRANE SEPARA-

artment of the Interior, Washington, D.C.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

Department of the Interior Patent Application, Serial Number 627,810, October 31, 1975. 18 p, 3

Descriptors: *Patents, *Desalination, *Waste water treatment, *Membrane processes, Separation techniques, Membranes, l *Electrodialysis, Desalination apparatus. Polymers,

A method for fabricating separators, particularly thin cell electro-membrane separators used in elec-trodialysis, transport depletion and other related electrochemical operations for the desalination of seawater, desalination of brackish water, brine concentration and other ion modification operations is described. The separators are positioned between an ion and cation exchange membranes in a stacked sheet arrangement and are designed to direct the orderly flow of ion-containing solutions through the stack. Because the efficiency of the stack is reduced by increased thickness of the separators, separator thickness is preferably minimized. The method includes placing a master stencil or mask on top of a plastic mesh which is laid out on a rigid backing sheet and pouring massive amounts of a curable polymer such as silicone rubber through the hole pattern formed in the stendil. The advances is the asset out to fill the set. cil. The polymer is then spread out to fill the pat-tern, the stencil removed and a cover sheet applied. The polymer is then pressed into the pores of the mesh using a roller applied against the cover sheet. The sandwich of the mesh and cover and backing sheets is placed into a pile between metallic sheets, and the pile is compressed during the curing of the polymer. The cover and backing sheets are then scraped off and the polymer impregnated mesh die cut to produce the required edge shape and flow holes. (Sinha - OEIS) W77-11917

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION

Department of the Interior, Washington, D.C. W. J. Wrasidlo. Patent Serial No. 615,252, Filing Date 22 Sep-

tember, 1975. 18 p.

*Patents Descriptors: *Membranes. *Semipermeable *Desalination, membranes, Films. Reverse osmosis, Water purification, Water quality.

Semipermeable membranes which are useful in reverse osmosis processes are prepared by form-ing a polymeric ultra-thin film which possesses semipermeable properties on a microporous sup-port. An example of the composite semipermeable membrane comprises an ultra-thin film formed by contacting an amine modified polyepihalohydri with a poly-functional agent. This film is deposited on one surface of a mocroporous substrate. It is also contemplated within the scope of this invention that the dried compostie semipermeable membrane may be subjected to an additional step whereby a protective coating is placed on the surface of the ultra-thin film. The protective coating may be a water soluble organic polymer. Examples of these water soluble organic polymers include polyvinyl alcohol, polyvinyl pyrrolidone, polyacrylamide, polyacrylic acid, etc. (Sinha -OEIS) W77-11918

RECURRENT PROBLEMS OF WATER SUPPLY IN MALTA,

Dundee Univ. (Scotland). A. S. Tricker.

Geography, Vol 62, No 275, Pt 2, April, 1977, p 118-121, 1 fig.

Descriptors: *Water supply, *Aquifers, *Saline water, *Desalination plants, *Water quality, *Saline water intrusion, Distillation, Salinity, Groundwater, Groundwater availability, Water conservation, Water demand, Pumping, Groundwater mining, Foreign countries, Water resources development, Water shortage, Water table Identifiers: *Malta.

High salinity of groundwater has been a recurrent problem in Malta. The major aquifer is in direct contact with saline waters of the Mediterranean and excessive pumping has, especially in the last ten years, brought a dangerous threat to water quality for non-agricultural use. To meet increased consumption with an adequate supply of high quality water, four seawater distillation plants had been put into operation by 1970. However, as a result of the 1973 rise in oil prices, three distillers were shut down and pumping increased, thus encouraging further intrusions of saline water. Despite the building of several storage reservoirs small dams to help reduce agricultural demand for groundwater and the imposition of water tariffs for swimming pool owners, Malta may soon find it difficult to satisfy the water requirements for its expanding economy. (Ullery-Arizona) W77-11988

WATER AND DEVELOPMENT IN SAUDI ARABIA

Durham Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 4B. W77-11991

3B. Water Yield Improvement

ROOF DRAINAGE OF LARGE BUILDINGS IN SOUTH AFRICA, University of the Witwatersrand, Johannesburg

(South Africa). Dept. of Civil Engineering. H. I. Schwartz, and P. T. Culligan.

The Civil Engineer in South Africa, Vol 18, No 8, p 171-176, August 1976. 12 fig. 11 ref.

Descriptors: *Rainfall, Thunderstorms, Pipes Roofs, *Drainage systems, Drainage engineering Capacity, Rainwater conduits, Hydrology, Design criteria, Maintenance, Storage tanks, Leaks, Waterproofing. Identifiers: *South Africa.

Short-duration high-intensity rainfall is ex-perienced in many regions of South Africa, caus-ing substantial damage to stock and machinery in buildings as a result of the inadequate capacity of roof drainage systems. Hydrologic and hydraulic aspects of roof drainage systems are considered with special reference to large buildings. Research findings based on hydraulic analyses and laboratory investigations are presented. Publications which cover the essential aspects of roof drainage system design are listed. (So African Water Info Center) W77-11555

EMPIRICAL PREDICTORS FOR NATURAL AND SEEDED RAINFALL IN THE FLORIDA AREA CUMULUS EXPERIMENT (FACE), 1970-

Virginia Univ., Charlottesville. Dept. of Environmental Sciences

R. Biondini, J. Simpson, and W. Woodley. Journal of Applied Meteorology, Vol. 16, No. 6, p 585-594, June 1977. 2 fig, 4 tab, 30 ref. NSF GI-

Descriptors: *Weather modification, *Cloud seeding, *Florida, Model studies, On-site investigations, Silver iodide, Nucleation, Rainfall, Precipitation(Atmospheric), Aircraft, Clouds, Cloud physics, Mathematical models, Forecasting, Analytical techniques, Weather, Meteorology. Identifiers: *Florida Area Cumulus Experiment(FACE).

The data obtained from the Florida Area Cumulus Experiment in the years 1970-75 were analyzed statistically. Specifically, a set of empirically derived predictors for both seeded and unseeded rainfall was identified. In this paper, first the experiment was described briefly, and the data were given. The concept of echo motion categories was presented. The responses to be predicted and the variables used as predictors were listed and described, and the methods for obtaining the prediction models were given. Next came a listing of the model equations obtained by the described methods, along with some commentary on their possible physical meaning. Examples illustrated the use of some of the prediction models for estimating seeding effects and possible bias in selection of experimental days. A discussion of the echo motion covariate and the basic predictor variables, their histories, rationales, and some theoretical indications of their importance completed the main body of the paper. (Sims-ISWS) W77-11596

EVALUATING WEATHERING CHARAC-TERISTICS OF WATER-HARVESTING CATCHMENTS FROM RAINFALL-RUNOFF ANALYSES, Agricultural Research Service, Phoenix, Ariz.

Water Conservation Lab. D. H. Fink, and G. W. Frasier.

Soil Science Society of America Journal, Vol. 41 No. 3, p 618-622, May-June 1977. 7 fig, 1 tab, 12

Descriptors: *Rainfall-runoff relationships, *Soil treatment, *Repellents, Rainfall, Runoff, Watersheds(Basins), Soil sealants, Waterproofing, Seepage, Sealants, Weathering, Water harvesting, Arid climates, Roofing materials, Water conservation, Water yield improvement, Surface sealing, This filler. Thin films.

Identifiers: Hydrophobics, Wax, Silicone, Paraf-

Better ways are needed to evaluate the weathering properties of water-repellent and membrane-covered water-harvesting field catchments. Nor-mally, only the ratio of runoff to precipitation from natural storms (percentage of runoff) is cal-culated, which provides useful information on treatment efficiency and durability, but which gives little information about why or how a treatment failed. Linear regression analyses of precipitation vs runoff-yield data collected over several years (storms with no runoff omitted) were obtain (1) threshold values, i.e., minimal rainfall needed to produce runoff, and (2) the runoff-efficiencies of treatments after threshold. The analyses showed that silicone and wax-treated water-repellent catchments weathered quite differently. The silicone treatcatchments ment showed a uniform deterioration throughout the treated zone, while the wax treatment showed a progressive deterioration beginning at the top of the treated profile. A gravel-covered membra catchment gradually increased runoff threshold from 1- and 2-mm water, which was ascribed to a gradual accumulation of dust entrapped in the gravel. The weathering properties of several other common type catchments were evaluated using the technique. A brief discussion was included on the application of the technique to evaluate the accuracy of precipitation- and runoff-measuring devices in water-harvesting systems. (Sims-ISWS) W77-11612

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CONNECTIONS BETWEEN CLIMATE AND DESERTIFICATION,
Toronto Univ. (Ontario). Inst. for Environmental

Studies. For primary bibliographic entry see Field 2B. W77-11629

WATER YIELD IMPROVEMENT BY VEGETA-TION MANAGEMENT, Arizona Univ., Tucson. Coll. of Agriculture.

P. F. Ffolliott, and D. B. Thorud.

Water Resources Bulletin, Vol. 13, No. 3, p 563-571, June 1977. 1 fig, 1 tab, 8 ref.

Descriptors: *Water vield improvement, *Vegetation effects, *Management, *Water supply, Precipitation, Evaporation control, Streamflow, Runoff, *Arizona, Assessment, Conifers, Mixed forests, Ponderosa pine trees, Chaparral, Upstream. Identifiers: Conversion, Multiple uses, Silvicultural treatments.

Vegetation management aimed at increasing the amount of usable water yield from precipitation falling on upstream watersheds may be one alternative for supplementing water supplies. Indica-tions are that water yields can be increased within a multiple-use framework, which can benefit, or simply fit with, other natural resource objectives. Through changes in vegetation on a watershed, one can reduce evaporation losses only slightly but can significantly increase streamflow runoff. In an assessment of potentials for water yield improvement in Arizona, experimental studies on various vegetation zones are reviewed. Because of either limited acreage or limited rainfall, the alpine, grassland, aspen, and desert shrub vegetation zones are not realistic management areas for Arizona. Furthermore, manipulation of pinyon-juniper woodlands does not appear promising at this time. Conversion of chaparral to grasses and forbs does appear to be a possible treatment for water yield improvement, as well as various silvicultural treatments of mixed conifer and ponderosa pine forests. Streamflow increases are given for experiments in chaparral, mixed conifer, and ponderosa pine vegetation zones, but complete information on possible constraints for these zones is not currently available. Specific assessment of water yield management options for riparian vegetation is difficult to make, due to incomplete knowledge of water yield changes and other constraints for this zone. Prior to the final adoption of management practices, results of experimental work must be coupled with economic and social considera-tions. (Bell-Cornell)

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTATION.

Geological Survey, Tucson, Ariz. Water Resources Div. For primary bibliographic entry see Field 2D. W77-11870

CONSERVATION IN KANO, For primary bibliographic entry see Field 4B. W77-11993

3C. Use Of Water Of Impaired Quality

SOIL AERATION, NITRATE REDUCTION AND FLOODING TOLERANCE IN HIGHER PLANTS,

Seville Univ. (Spain). Dept. of Ecology. F. Garci-novo, and R. M. M. Crawford. New Phytol. 72(5), p 1031-1039, 1973.

D

Descriptors: *Soil aeration, *Nitrates, Flooding, Plant growth, Roots, Leaves, Amino acids. Identifiers: Anaerobiosis, NADH2, *Nitrate reductase activity, *Flood tolerance(Plants), Anoxia.

Flood-tolerant species from natural habitats differ from flood-intolerant species by being able to make more effective use of NO3 as an alternative electron acceptor to O2 during periods of partial anaerobiosis. When flooded, tolerant species show marked increases in nitrate reductase activity in

roots and leaves. A greater ability to synthesize amino-acids under anoxia was also found in the tolerant species than in the intolerant. It is suggested that these properties enable the flood-tolerant species to facilitate the re-oxidation of NADH2 under conditions of anoxia and that this is associated with the greater ability of the species to withstand a reduction in the partial pressure of O2.—Copyright 1974, Biological Abstracts, Inc. W77-11517

SALT AND SODIUM AFFECTED SOILS IN RELATION TO NITROGEN UTILIZATION BY WHEAT.

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
K. B. Hummadi.

Ph.D. Dissertation, 1977. 83 p, 12 fig, 9 tab, 83 ref, 1 append.

Descriptors: *Nitrogen, *Sodium, *Crop response, *Salts, *Wheat, Soils, Salinity, Saline salts, Plant growth, Crop production, Crops, Soil treatment, Irrigation, Irrigation water, Arid lands, Fertilizers, Environmental effects.

The presence of a large amount of soluble salts in soils of arid and semi-arid regions is an important factor in limiting agricultural productivity. The pri-mary source of these salts is either the continuous use of poor quality irrigation water or evaporation in areas having a high saline water table. Nitrogen is an important element in determination of crop and quality. Research concerned with the growth, yield, and nitrogen utilization of wheat under saline and sodic conditions was conducted with the following objectives: (1) to evaluate the effect on nitrogen uptake of wheat of mixed salts, including sodium, in the soil solution or irrigation water, (2) to evaluate the effects of variable nitrogen fertilizer levels and mixed salinity and sodium on grain and straw yields; (3) to examine the nitrogen status of wheat as reflect by NO3 con-tent of leaves under a range of salinity and exchangeable sodium regimes; and (4) to deter-mine effects of the level of salinity and exchangeable sodium on the beneficial response to nitrogen fertilizer. The results are presented. (Jamail-Arizona)

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND SOIL SALINITY.

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.
For primary bibliographic entry see Field 4B.

W77-11627

STUDIES ON DRAINAGE WATER OF BEHIRA GOVERNORATE: THE SUITABILITY OF EL-KHYRI GROUP DRAINS,

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

M. M. El-Banna, M. H. Selim, B. Sh. Zikry, W. A. Abou-Zeid, and S. A. Gafar.

Abou-Zeid, and S. A. Gafar. Agricultural Research Review (Cairo), Vol 54, No 4, April 1976. p 23-33, 3 fig, 4 tab, 7 ref.

Descriptors: *Saline water, *Drainage water, *Irrigation effects, *Water quality, *Soil-water-plant relationships, Irrigation, Irrigation water, Water quality standards, Salinity, Water analysis, Adsorption, Water properties, Drainage effects, Available water, Arid lands, Alkalinity, Leaching, Alkaline water, Crops production, Diversion, Solubility, Salts. Identifiers: *Egypt.

The practice of diverting saline water for irrigation of virgin land in Egypt requires water quality information. Monthly water samples from different sites along four main drains were taken and analyzed for irrigation suitability. Data on electrical conductivity, sodium adsorption ratio, and

residual sodium carbonate of the water samples showed the drainage waters to be of medium salinity and low alkalinity. Water quality generally indicated suitability for irrigating. Moderate to high salt tolerant crops on medium textured soils can be maintained with adequate drainage and leaching. (Ullery-Arizona) W77-11634

EFFECT OF SODIUM CHLORIDES AND SODI-UM SULFATE ON PLANT COMPOSITION, (IN RUSSIAN).

Akademiya Nauk SSSR, Moscow. Inst. of Plant Physiology. V. V. Kabanov, and Zh. Otegenov.

V. V. Kabanov, and Zh. Otegenov.Fiziol Rast. 20(4), p 806-814, 1973.

Descriptors: *Sodium sulfate, Plant physiology, Peas, Beans, Sodium compounds, Crops, Tomatoes, Leaves, Roots. Identifiers: Ash, Glasswort, Halophytes, Mung, *Sodium chloride.

The content of ash residue, water and organic sub-stances was studied in the roots, stems and leaves of legumes (pea, Phaseolus, bean and mung bean), tomato and glasswort. The dynamics of mineral accumulation showed that the ash residue played only a small role in the total balance of components, but the ratio between organic substances and water changed sharply with excess of Na+, Cl- or SO4(2-). Five-113% of ash/g organic sub-stance accumulated in the plant if 0.3% NACl or Na2SO4 were contained in the nutrient solution. Different organs of various halophytes, growing under natural conditions, contained 13-62% (our data) or 3-120% (data of other authors) of the ash residue. Calculation of the hydrophilic coefficient of organic substance for extreme points, taking into consideration the degree of water binding by the ash residue, suggested that water supply for metabolic processes can decrease both during SO4 and Cl salinization. The method of calculation allows comparable data to be obtained for all organs and tissues of any biological object. From 3-13 water can be utilized in metabolism by 1 g of organic substance in functioning tissues of the stu-died plants. Plants belong to salt-accumulating systems according to their accumulation coefficient (g of the ash residue in the substrate/g of the ash residue in the plant). The curves for the con-tent of the ash residue, water and organic sub-stance in the tissues of the studied plants are of the extreme character; the minima of the content of organic substance coincide with the points where the ionic resistance of the plants change.—Copyright 1974, Biological Abstracts, Inc. W77-11832

THE USE OF POLLUTED SOURCES FOR WATER SUPPLY,
North Carolina Univ. at Chapel Hill. Dept. of En-

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 5F. W77-11858

SALINITY EFFECTS ON NITROGEN USE BY WHEAT CULTIVAR SONORA, Soil Testing Labor, Inspect th (India)

Soil Testing Labs., Junagadh (India). For primary bibliographic entry see Field 3F. W77-11946

COMPARISON OF MODIFIED MONTMORIL-LONITE TO SALTS AND CHELATES AS CAR-RIER FOR MICRONUTRIENTS FOR PLANTS: I. SUPPLY OF COPPER, ZINC, AND MAN-GANESE.

Hebrew Univ., Rehovoth (Israel). Dept. Soil and Water Science.

A. Banin, and J. Navrot.

Agronomy Journal, Vol. 68, No. 2, p 353-358, March-April 1976. 4 fig. 7 tab, 16 ref.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use Of Water Of Impaired Quality

Descriptors: *Nutrients, Fertilizers, Fertilization, *Copper, *Zinc, *Manganese, Clays, Tomatoes, Beans, Crop response, *Montmorillonite, Salts, Chelater

The purpose of the study was to compare the effectiveness of a novel micronutrient fertilizer, modified montmorillonite clay, to the conventionally used salts and chelates as carriers of micronutrients to plants. Three elements—Cu, Zn, and Mn—in combination in various rates, and in three forms, as sulphates, EDTA chelates, or attached to montmorillonite clay, were applied to two micronutrient deficient sandy soils. Tomato and beans were grown under controlled green-house conditions in the treated soils. The applica-tion of micronutrient elements, in all of the forms used, significantly increased plant yields. In addition, the supply of micronutrients significantly increased the elemental concentrations of the plants. However the highest concentration of elements found in the plants did not always correspond to the highest yields. Generally the lower levels of addition of combined micronutrients improved the growth conditions considerably and the higher ones were less effective. The clay carrier was similar to the expensive chelates and generally more efficient than the salts in element supply and this resulted in better yield responses. The optimal rate of application of the combined elements for dry yield production in tomato plants in the soils studied appeared to be: 0.5 mg Cu, 1.6 mg Zn, and 2.5 mg Mn per kg of soil for the clay and chelate forms and somewhat higher for the salts. (See also W77-11955) (Skogerboe-Colorado State) W77-11954

COMPARISON OF MODIFIED MONTMORIL-LONITE TO SALTS AND CHELATES AS CAR-RIER FOR MICRONUTRIENTS FOR PLANTS: II. SUPPLY OF IRON.

Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science

J. Navrot, and A. Banin.

Agronomy Journal, Vol. 68, No. 2, p 358-361, March-April 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Iron, *Nutrients, Fertilizers, Fertilization, Copper, Zinc, Manganese, Clays, Tomatoes, Beans, Crop response, *Montmorillonite, *Chelates. Identifiers: Micronutrients.

Symptoms of iron deficiency appear very frequently in the calcarcous soils which represent a major part of the agricultural soils of Israel; therefore a search for novel carriers of iron is constantly conducted. Previous studies showed that Cu, Zn, and Mn, attached to modified montmorillonite, can effectively replace salts and chelates as carriers for micronutrient elements for plants. In this research, the effect of iron attached to mo morillonite clay on element uptake and yield of plants was compared to that of commonly used iron sulphate or EDTA and EDDHA chelates. In the greenhouse, beans were grown in two calcareous, iron deficient soils and were treated with either FeSO49 Fe(+3)-EDTA, Fe(+3)-EDDHA, or Fe(+2) bound to montmorillonite clay. The or Fe(+2) count to montmormorme casy. The rates of iron added varied from 15 to 60 mg Fe/kg soil for the salt and 3 to 12 mg Fe/kg soil for the chelates and the clay forms. It was found that Fe(+2)-clay and Fe(+3) in chelates, added at equivalent rates, supplied iron in comparable amounts; FeSO49 added at the conventional rates which are fixed to the the than the dadd. which are five to ten times higher than that added as clay- and chelate-bound iron, caused similar or lower uptake and yields. Moreover, the slow release of iron from Fe-clay, even when supplied in high rates, prevented excessive iron uptake which otherwise, as in the case of the chelate FeEDDHA, interfered with plant development. It is suggested that iron attached to mortmorillonite clay can be used as an efficient source of iron for plants grown in calcarcous soils. (See also W77-11954) (Skogerboe-Colorado State)

ADVANTAGES OF USING HIGH SALT-SODI-UM WATERS IN THE RECLAMATION OF GYPSIFIED HEAVY-TEXTURED SOIL, Ministry of Agriculture, Cairo (Egypt). Soil and Water Research Inst.

For primary bibliographic entry see Field 2G. W77-11994

EFFECT ON IRRIGATION WATER QUALITY, SULFURIC ACID AND GYPSUM ON PLANT GROWTH AND ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF PIMA SOIL,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. R I Alawi

Ph.D. Dissertation, 1977. 127 p, 24 fig, 14 tab, 78 ref. 1 append.

Descriptors: *Salinity, *Alkalinity, *Water quali-ty, *Infiltration, *Irrigation water, Infiltration rates, Irrigation, Irrigation practices, Physical pro-perties, Chemical properties, Gypsum, Hydrogen, Sulfide, Plant growth, Crop growth, Mathematical models, Cation exchange, Calcareous soils, Arid lands, Semiarid climates, Sudangrass, Soil analysis, Leaching. Identifiers: Pima soil.

Salinity and alkalinity are major and ever present threats to the permanence of irrigation agriculture in arid and semiarid regions. Quality of irrigation water is one of the most important factors which influence soil water management practices, plant growth, and plant yields. Field and laboratory experiments to determine the effects of the quali water and chemical amendments (gypsum and sulfuric acid) on growth and yields of sundangrass, total soluble salt and ionic distribution, and the infiltration rates of a Pima soil were conducted at the University of Arizona Experimental Farm, Safford, Arizona, over a period of five years. Three types of water-well, river and city-were utilized. During the last two years, gypsum and sulfuric acid were added to the water. The results are presented. Sulfuric acid increased infiltration rates significantly with all water treatments; gypsum in-creased infiltration only with well water treatment. Regression equations were developed to predict time and depth of water required to le foot of Pima soil column to a specific electrical conductivity with a given quality of water and a given type and rate of chemical amendments. (Jamail-Arizona)

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,
Central Soil Salinity Research Inst., Karnal

(India).

For primar W77-12000 ary bibliographic entry see Field 2G.

RECLAMATION OF A SALINE-SODIC SOIL BY HIGH SALTWATER-DILUTION THE METHOD

Department of Agriculture, Lethbridge (Alberta). Plant Industry Div. H. S. A. Vander Pluym, J. A. Toogood, and R. A.

Can J Soil Sci. 53(4) p473-480, 1973.

Descriptors: *Saline soils, *Alkaline soils, Dispersion, Salts, Montmorillonite, *Sodium, *Adsorption, Permeability, Solubility, Conductivity, Soil moisture, *Land reclamation.

Changes in the permeability and the swelling of a montmorillonite-rich soil were measured for a range of Na adsorption ratio (SAR) ad electric conductivity (EC) values of the leachant. Concentrations, related to a 20% drop in hydraulic conductivity (HC) and the start of a rapid swelling process, were between 40 and 400 meg/1, and were

caled 'threshold' and 'jump-off' concentrations, respectively. The initial leaching of the soil cores with highly saline solutions gave high HC values for the leachants with high SAR's and low HC values for the leachants with low SAR's. Subsequent tests with diluted solutions reversed the situation; solutions with high SAR's lowered the HC of the soil drastically to HC values well below those of the soil cores treated with low SAR leachants. Solutions with a low FC or a high SAR leachants. Solutions with a low EC or a high SAR, or both, maintained in their leachates EC and SAR or out, manuamed in their leachates EC and SAR values above and below, respectively, the expected equilibrium values. Increased solubility of the 40.6 t/ha of gypsum accounted for the discrepancy.—Copyright 1974, Biological Abstracts, Inc. W77-12035

PRELIMINARY STUDY ON SOME SALINE SOILS OF PERU USING A HYDROPHOBIC EMULSION,

Pontificia Universidad Catolica del Peru, Lima.

A. Flores. Meded Fac Landbouwwet Rijksuniv Gent. 37(3), p 1066-1075, 1972.

Descriptors: *Saline soils, *Soil treatment, Methodology, Land reclamation, Soil analysis, Hydraulic conductivity, Emulsions. Identifiers: *Peru, *Hydrophobic emulsions.

A method of soil treatment was tried to improve the soil structure of these soils in a shorter amount of time than required by present reclamation methods. Soils samples were treated with a bitumenous emulsion in the laboratory. Hydraulic conductivity was increased 7-9 times in 3 of the treated samples, but was only doubled in a fourth sample. The latter sample was lower in clay than the others.—Copyright 1974, Biological Abstracts,

W77-12044

RESPONSES OF THREE PEANUT CULTIVARS TO GYPSUM.

Georgia Coastal Experiment Station, Tifton. Dept. of Agronomy

bibliographic entry see Field 3F. For primary W77-12129

SALT TOLERANCE OF PROSTRATE SUMMER CYPRESS (KOCHIA PROSTRATA), Agricultural Research Service, Riverside, Calif.

Salinity Lab. L. E. Francois.

Agronomy Journal, Vol 68, No 3, p 455-456, May-June 1976. 2 tab, 9 ref.

Descriptors: Salinity, Saline soils, *Salt tolerance, Greenhouse experiments, Sodium, Chloride, Rangelands. Identifiers: *Cypress.

Prostrate summer cypress, a widely distributed perennial shrub in Russia, was imported into the USA to determine its potential as an acceptable forage on the western rangelands. Since considerable acreage of its possible habitat contains salt-affected soils, a salt tolerance study was done to determine how well suited it was to these saline areas. Two accessions of prostrate summer cypress were tested using soil cultures in the greenhouse. Salinity levels used were 2, 7, 11, and 17 mmho/cm. The plants were harvested six time over a 3-year period. Both accessions proved to be very salt tolerant but one was significantly more productive than the other at all salinity levels. Although sodium and chloride contents ap-proached 50 and 85 meg/100 g dry matter, respectively, no salt injury symptoms were visible. Sodium uptake increased proportionately with increasing salinity, whereas chloride uptake was less dependent on salt concentration and appreciable greater than that of sodium. Since both accessions proved to be highly salt tolerant, they should be well adapted for planting in the salt-affected western rangelands. (Skogerboe-Colorado State)

3E

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W77-12133

3D. Conservation In Domestic and **Municipal Use**

WATER CONSERVATION FOR DOMESTIC USERS, WITH SPECIAL REFERENCE TO WARM DESERT CLIMATES.

Arizona Univ., Tucson; and Arizona State Water

and Sewer Dept., Tucson.
Handbook prepared by the University of Arizona for the City of Tucson, Department of Water and Sewers, 1977. 32 p, 13 fig, 6 tab, 4 append.

Descriptors: *Water conservation, *Water utiliza-tion, *Water users, *Arizona, *Water consump-tion(Except consumptive use), Domestic water, Competing uses, Conservation, Water reuse, Arid lands, Water requirements, Water supply, Irriga-tion, Irrigation systems, Deserts. Identifiers: *Tucson, Drip irrigation.

Water should be regarded as a precious commodi-ty, yet in many households it is over-used or wasted. This booklet is designed to aid residential water users, especially those in warm desert climates, in detecting areas where domestic water can be conserved and in effecting appropriate and economical conservation measures. Following the introductory section, various indoor water uses are described, with some tips on where and when water use can be reduced. Outdoor water uses are considered, with particular attention given to land-scape irrigation since most consumptive use of residential water supply occurs in the watering of lawns, gardens, trees, and shrubs. Various irriga-tion methods are discussed. Water reuse is also evaluated and the future outlook for water conservation is presented. Recommendations for future research are outlined and include: (1) monitoring research are outlined and include: (1) monitoring water conservation practices to determine how effective they are, (2) city and county government consideration of water conservation regulatory measures, and (3) implementation of an educational program concerned with water conservation. (Jamail-Arizona) W77-11636

NEW GROWTH CENTERS--A ROLE FOR THE BUREAU OF RECLAMATION, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering. For primary bibliographic entry see Field 6B. W77-11775

USER MANUAL FOR SEWER AND WATER AC-COUNTS PROCESSING MODULE. For primary bibliographic entry see Field 5G. W77-11856

WATER AND SEWER RATES IN MINNESOTA, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics. For primary bibliographic entry see Field 6C. W77-11868

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AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT RESOURCES, OF URBAN WATER

Utah Water Research Lab., Logan. For primary bibliographic entry see Field 5G. W77-12165

3E. Conservation In Industry

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS, General Electric Co., San Jose, Calif. H. V. Clukey, M. J. McNelly, and R. C. Mitchell.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-253 630, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Electric Power Research Institute, Palo Alto, CA, Report EPRI NP-150, February, 1976. 122 p. 14 tab, 37 fig, 34 ref, 3 append. NP-150 Res. Proj. 516-1.

Descriptors: *Nuclear powerplants, *Water cooling, *Water conservation, Consumptive use, Costs, Reclaimed water, Evaporation control, Water management.

Identifiers: *Peak shaved dry/wet cooling, Wet cooling, Dry cooling.

U.S. requirements for uncommitted nuclear installations in water scarce areas are minimal, falling in the range of 6000 to 2300 megawatts of electricity (MWe). Plant cooling for nuclear power plants in these areas will require innovative systems such as water reclamation or transportation which makes water available for evaporative use in sufficient quantities, or cooling system designs which greatly quantities, or cooling system designs which greatly conserve water usage. In order to evaluate how water scarce areas might best be serviced for their plant cooling needs, three representative sites were selected which had typically high summer dry bulb temperatures but substantially different wet bulb temperatures. All three were near potential load growth centers where water limitations exist. The sites include Reno, Nevada, Raleigh, North Carolina, and Lubbock, Texas. The study evaluates the costs and water consumption of three cooling systems, dry, wet and reak shaved three cooling systems: dry, wet, and peak shaved dry/wet with separate towers. The three cooling systems were matched to four kinds of nuclear power plants: light water reactors, high tempera-ture gas cooled reactors (HTR) with steam tur-bines, HTR with gas turbines, and liquid metal fast breeder reactors. The study concludes that light water reactors can operate at any U.S. location with peak shaved dry cooling systems and conventional turbine units. (Nessa-NC) W77-11848

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS,

AME Technology, Inc., Lexington, Ky. For primary bibliographic entry see Field 6G. W77-11851

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES,

Southern Methodist Univ., Dallas, Tex. Inst. of Tech.

J. A. Savage, E. E. Weynand, and W. G. Wyatt. J.A. Savage, E. Weynand, and W. Wyadt. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-243 350, Price codes: A04 in paper copy, A01 in microfiche. Submitted to Texas Governor's Energy Advisory Council, Austin, January 15, 1975, 49 p, 4 tab, 11 fig. 20 csf. N/C-9 fig, 20 ref. N/T-9

Descriptors: *Electric power production, *Tidal powerplants, *Thermal powerplants, *Electric power costs, *Texas, *Gulf of Mexico, Capital costs, Aluminum, Pumped storage. Identifiers: *Propane heat cycle, Wave action generator, Aluminum smelting.

Three basic methods exist for generating electricity in the Gulf of Mexico. These are: (1) a floating propane heat cycle that makes use of the temperature difference between surface and bottom water; (2) a pumped storage hydroelectric installation on Padre Island; and (3) a wave action generator powering an air turbine that drives an alternator to produce electrical energy. Of these three, the most promising is the floating power plant that makes use of propane as a working fluid, with a capital investment of about \$445/KW of capacity. If this is used with a floating aluminum smelting plant, there would be no need for an undersea power cable. The hydroelectric plant would have a capital cost of approximately \$2,800/KW of capacity.

This cost can be reduced to \$1,800/KW with the use of dual purpose pump and turbine units. The wave action generator, with a capital investment of about \$12,500/KW of capacity, has been used for small amounts of power. A combined use of the three methods by 1985 would produce 651,000 KW at a capital cost of \$844/KW of capacity. Most of this energy would be used for the production of aluminum. By the year 2000 about ten times as much power as in the year 1985 could be produced. (Nessa-NC) (Nessa-NC W77-11854

3F. Conservation In Agriculture

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COM-POUNDS, (IN JAPANESE), Tokai-Kinki National Agricultural Experiment

Station, Tsu (Japan).
For primary bibliographic entry see Field 5B.
W77-11515

APPLICATION OF HERBICIDES THROUGH A MICROJET IRRIGATION SYSTEM, Citrus and Subtropical Fruit Research Inst., Nelspruit (South Africa).

G. S. Bredell, C. J. Barnard, and A. P. Vincent. The Citrus and Subtropical Fruit Journal, p 17-18, May 1975. 3 fig.

Descriptors: *Herbicides, Trees, *Irrigation systems, Irrigation, Plant growth, Weed control, Paraquat, Wetting agent, Agriculture, Farm wastes, Application rates.

Identifiers: South Africa.

Attempts were made to apply a registered contact herbicide namely PARAQUAT through a microjet irrigation system. Several aspects had to be considered before attempting this operation. These include the possible effects of the weedkiller on the trucks of the trees, times of application in relation to applying irrigation water, and concentration required for effective action against weeds. One-year-old citrus, avocado, mango, litchi and macadamia trees were used in this field trial. From the preliminary observations it seems reasonable to conclude that weeds can be effectively controlled when using this approach. Since no harmful symptoms have been noticed on the trees, it also appears as if the method is perfectly safe. Applying the herbicide at a concentration of 4 1/ha, the cost per tree amounts to 1,25 cent. At an estimated application frequency of seven times per year, it should be possible to control weeds at 9 cent per tree per year. About 15 minutes is all that is required to apply herbicides to 300 trees. Using a tractor and spray pump, the same operation would take about 9 hours. (So Arican Water Info Center)

MICRO IRRIGATION OF SUBTROPICAL

FRUIT CROPS, Citrus and Subtropical Fruit Research Inst., Nel-

G. S. Bredell, and C. J. Barnard.
The Citrus and Sub-Tropical Fruit Journal, No. 497, p.5-10, 1975. 6 fig., 2 tab, 18 ref.

Descriptors: Irrigation design, Irrigation practices, Irrigation, Soil-water-plant relationships, Water requirements, Groundwater movement, Droughts, Soil moisture, Fertilizers, Trees, Water distribution(Applied), Tensiometers, Plant growth. Identifiers: South Africa.

The favourable response of subtrophical fruit trees to conditions of low soil moisture tension has become an established fact. Two ways of achieving low moisture tension in the upper 15 cm of soi where most of the feeder roots are found, are, either by mulching and apply relatively large quan-

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

tities of water at fairly widely spaced intervals of time, or by applying small amounts of water at short intervals. The latter process is called micro irrigation. Certain problems were encountered with drip irrigation. These were, poor lateral distribution of soil moisture, accumulation of salts on ems were encountered the wet-dry interface, and the inability to carry in-soluble fertilizers which are broadcast on the soil surface, into the rootzone. Where microjets were used, these problems were eliminated. Moreover, the latter is a more flexible system in that it can easily be manipulated to accommodate tree size. Water can therefore be applied over the exact area of root distribution. The magnitude of soil moisture fluctuation in the feeder root zone was studied in an orchard where both micro irrigation and conventional longer cycle sprinkler irrigation, so called macro irrigation, were applied. Where micro irrigation was applied, soil moisture varied within the limits of readily availabe water. When macro irrigation cycle lengths extended to periods of more than 20 days, readily available moisture was completely depleted. Exact management of irrigation applications in the case of micro irrigation was found to be more accurate than with conven-tional systems. The implementation of a homemade evaporation plan in managing irrigation acto evapotranspirative demand is ed. (So African Water Info Center) cording W77-11559

MANAGEMENT CRITERIA FOR MINIMIZING WATER LOSSES AND WILTING UNDER DRIP IRRIGATION SYSTEMS,

Soil and Irrigation Inst. Pretoria (South Africa).

A. Streutker.

The Citrus and Subtropical Fruit Journal, p 13-16, May 1975, 5 fig.

Descriptors: Irrigation practices, Soil-water-plant relationship, Water requirements, Groundwater movement, Moisture content, Droughts, Plant Drip irrigate.
Management, Soil moisture, Tensiometers, Gravimetry, Moisture deficit. Identifiers: South Africa

One year after changing to a drop system several nine year-old Valencia trees, in a section of an orchard near Groblersdal, started to show signs of moisture stress. The soil moisture percentage was measured gravimetrically in February, at different distances and depths in the red sandy clay loam soil (Shorrocks series of 20% clay, underlain by gravel at 0.5 m) underneath a healthy as well as grave: at 0.5 m) undermeant a nearmy as well as under a poor tree, and points having the same value were joined to produce a soil moisture profile. From the soil moisture profiles beneath the healthy tree (both parallel and normal to the drip line) it is evident that a uniform moisture distribution in the shallow soil was obtained by means of a combination of a 0.6-0.9 m spacing between drippers, and drip intensity of 2.3 1/h, an irrigation period of five hours and an irrigation frequency of every second day. In contrast therewith the soil moisture profiles beneath the poor tree show a 0.6 m gap of dry soil between two drippers. Under the preceding conditions the distance of 1.5 m between two drippers was too large. (So African Water Info Center) W77-11560

ANALYSIS OF THE TEMPORAL REHAVIOUR OF THE LEVEL OF LAKE MALAWI, University of the Witwatersrand, Johannesburg

(South Africa). Dept. of Geography and Environmental Science. For primary bibliographic entry see Field 2H. W77-11565

ESTIMATION OF NET WATER DEMAND OF CROPS IN THE UPPER BERG RIVER VALLEY, Soils and Irrigation Research Inst., Potchefstroom (South Africa). A. L. Du Pisani, and H. W. Weber.

Water SA., Vol. 2, No. 2, p 77-85, 1976. 10 tab, 5 fig. 5 ref.

Descriptors: *Water demand, Evapotranspiration, Soil moisture, *Crop production, *Estimating, Climatic data

Identifiers: Berg River, Greater Boland Water Project, South Africa.

The development and implementation fo a soil moisture budget approach is described whereby good estimates were obtained for both effective rainfall and new water demand (NWD) in the Upper Berg River valley for two crop canopies, i.e., clean-clutivated orchards and vineyards and a crop totally shading the soil surface. Net water de-mand was affected by both geographical location (an increase from south to north, and westward away from the mountains) and total available soil moisture capacity. Both factors combined produced a variation of only about 20 per cent, so that a median value of 650 mm NWD should suffice for most situations. (So African Water Info Center) W77-11580

EVALUATION OF THEORETICALLY PREDICTED THERMAL CONDUCTIVITIES OF SOILS UNDER FIELD AND LABORATORY CONDITIONS,

Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soil and Water. For primary bibliographic entry see Field 2G. W77-11611

DRIP IRRIGATION-A NOVEL METHOD TO SAVE WATER,

Tamil Nadu Agricultural Univ., Coimbatore (India). Dept. of Soil and Water Conservation.
R. K. Sivanappan, and D. Chandrasekaran.
Irrigation and Power, Vol 33, No 4, p 495-501, October 1976. 4 fig, 1 tab, 5 ref.

Descriptors: *Irrigation systems, *Irrigation effects, *Irrigation efficiency, *Water conservation, *Irrigation operation and maintenance, Crop production, Water management(Applied), Operating costs, Economic efficieny, Saline water, Saline soils. Identifiers: *Drip irrigation, *India

Drip irrigation keeps the soil moisture level at field capacity, saves up to 70% of the irrigation water compared with other methods, and increases the yield of certain crops. The method is suited to all terrains and soil types and is now being introduced in India where water scarcity and population growth are especially acute problems. Construction and operation of the system are described, in-cluding methods of achieving uniform flow distribution by adjusting emitters and making various pipe adjustments. Row crops like chilly, brinjal, radish, beet root and tomato can be irrigated by the drip method; irrigation uniformity up to 90% can be achieved, resulting in higher yield. Other advantages include minimum weed growth, no need for land levelling, and reduced labor cost; highly saline soil or saline water can be utilized in conjunction with this method. (Jahns-Arizona) W77-11621

WATER RELATIONS AND GROWTH OF SOYBEANS IN DRYING SOIL, Agricultural Research Service, Stoneville, Mo. For primary bibliographic entry see Field 2I. W77-11622

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND

USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION,
Central Arid Zone Research Inst., Jophpur (India).
For primary bibliographic entry see Field 4D.
W77-11628

EXPERIMENTAL EVALUATION OF A CROP CLIMATE SIMULATION MODEL FOR INDIAN

CLIMATE SIMULATION MODEL FOR INDIAN CORN (ZEA MAYS L.),
Agricultural Univ., Wageningen (Netherlands).
Dept. of Physics and Meteorology.
C. J. Stigter, J. Goudriaan, F. A. Bottemanne, J. Birnie, and J. G. Lengkeek.
Agricultural Meteorology, Vol 18, No 3, p 163-186, June 1977. 12 fig, 2 tab, 31 ref.

Descriptors: *Micrometeorology, *Canopy.
*Corn(Field), *Model studies, *Crop production,
Climatic data, On-site tests, Thermal conductivity,
Radiation, Turbulence, Wind velocity, Transpiration, Microclimatology, Soil surfaces, Air temperature, Humidity, Profiles.

A micrometeorological model is outlined and evalattention and the microclimate in a corn crop. The simulation model is composed of a number of interacting submodels, the main features of which are discussed; soil characteristics that must be known are thermal conductivity and heat capacity. Dynamic simulation involves radiation, turbulence and wind, leaf assimilation and transpiration, balances at the soil surface and heat movement in the soil. Comparison of measured and simulated characteristics of the microclimate indicated that the absorption of radiative energy and the leaf and boundary layer resistances are adequately simulated so that the model represents a basis for simulation models of crop production. Air temperature and humidity profiles are also reasonably simulated but can be improved by a better incorporation of spatial and temporal variations of turbulence and wind as a function of the canopy characteristics. Data from field experiments in 1972 and 1973 are presented. (Jahns-Arizona) W77-11631

WATER REPELIENCY OF SOILS UNDER CITRUS TREES IN EGYPT AND MEANS OF IMPROVEMENT,

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

For primary bibliographic entry see Field 2I. W77-11633

CONTROLLED-ENVIRONMENT AGRICUL-TURE AND THE DEVELOPING COUNTRIES. Arizona Univ., Tucson. Environmental Research Lab.

For primary bibliographic entry see Field 6B. W77-11640

OCHRE AND SUBSURFACE DRAINAGE IN CULTIVATED ORGANIC SOILS OF WILLARD MARSH, OHIO,

Ohio State Univ., Columbus. Dept. of Agronomy. For primary bibliographic entry see Field 2J. W77-11797

DIURNAL SOIL WATER REGIME IN THE TILLED PLOW LAYER OF A WARM, HUMID CLIMATE,
Southern Piedmont Conservation Research

Southern Piedmont Conservation Res Center, Watkinsville, Ga. For primary bibliographic entry see Field 2G. W77-11826

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS. Development and Resources Corp., Sacramento, Calif.

For primary bibliographic entry see Field 6F. W77-11850

DISPERSAL OF PHYTOPHTHORA PAL-MIVORA SPORANGIA BY WIND-BLOWN DISPERSAL RAIN, New York State Agricultural Experiment Station, Geneva. Dept. of Plant Pathology.

J. E. Hunter, and R. K. Kunimoto. Phytopathology. 64(2), p 202-206, 1974.

Descriptors: *Path of pollutants, Rain, Wind, *Spores, Orchards, *Fruit crops, *Plant diseases, Humidity, Hawaii.

Identifiers: *Carica papaya, Phytophthora infestans, *Phytophthora palmivora, Sporangia.

Sporangia of P. pamivora produced on papaya (Carica papaya L.) could not be recovered on Hirst spore trap slides, even though infected fruits surrounding the trap or in wind tunnels were sub-jected to a wide range of meteorological condi-tions suitable for release of dry sporangia of P. infestans from potato leaves. However, wind-blown rain collected from severely diseased orchards contained sporangia. Rain-splash experiments showed that sporangia are readily released in splash-droplets formed when rain drops impact on disease lesions. Detached sporangia held at relative humidities lower than 100% dehydrated in 2-4 min and failed to germinate when placed in water. There was an inverse relationship between temp. and survival of detached sporangia. Sporangia attached to papaya fruits can survive drying conditions, therefore these spores serve as a source of inoculum which can be dispersed by wind-blown rain. Intermittent showers capable of detaching sporangia are common during the night in Hawaii and survival of the sporangia would be expected because the humidity is usually 100% for 8-9 h each night of the year. Thus, wind-blown rain is an ideal spore release and dispersal mechanism for survival of this species. Copyright 1974, Biological Abstracts, Inc. W77-11927

AN EPIDEMIOLOGICAL STUDY OF MUMMY BERRY DISEASE OF HIGHBUSH BLUEBERRY, Michigan State Univ., East Lansing. Dept. of

D. C. Ramsdell, J. W. Nelson, and R. Meyers. Phytopathology. 64(2), p 222-228, 1974.

Descriptors: *Epidemiology, *Plant diseases, *Blueberries, Fruit crops, Michigan, Humidity, Germination, Leaves, Spores.

Identifiers: Monilinia vaccinii corymbosi, *Mummy berry disease, Vaccinium corymbosum, *Ascopores.

A Burkard recording volumetric spore trap was operated in a highbush blueberry (Vaccinium corymbosum L.) field in Michigan April 19-June 15, 1972. Ascospores of Monilinia vacciniicorymbosi (incitant of mummy berry disease) were trapped from April 28-May 11, a period during which the bushes progressed from green tip to pink bud prebloom stage. Ascospore discharge occurred mostly during daylight when relative humidity (RH) was < 100%; very few spores were trapped at night when RH was 100%. Ascospore discharge was inversely correlated with RH and wind speed (P = < 0.001 and < 0.01, respectively). Nocturnal periods of continuous leaf wetness ranged from 5.5-12.0 h which, according to germination studies on glass slides, could allow primary infection to occur. Bushes had a mean of 92 visible leaf and shoot infections by May 23. Triarimol sprays applied 72 h after the 1st major ascospore discharge on May 4, while bushes were still at the green tip stage, and again on May 15, were much more effective in reducing primary infection than sprays applied only on May 15. Trapping of conidia commended May 19, when happing of combine combine and way 19, when bushes were at 20% pink bud prebloom stage, and ended June 3 at petal fall. Large numbers of conidia were trapped both during day and night. Release of conidia was inversely correlated with leaf wetness (P = < 0.1) and directly correlated with wind speed (P = < 0.1). Continuous leaf wetness (P = < 0.1). Continuous leaf wetness (P = < 0.1). ness at night ranged from 1.5-12.0h during the period conidia were trapped. Copyright 1974, Biological Abstracts, Inc. W77-11928

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EFFECT OF SOIL MOISTURE TENSION AND AMENDMENTS ON YIELDS AND ON HERB-AGE N, P, AND S CONCENTRATIONS OF AL-

Department Agriculture, (Saskatchewan).

W. F. Nuttall. Agronomy Journal, Vol. 68, No. 5, p 741-744, September-October 1976. 5 tab, 9 ref.

Descriptors: *Alfalfa, Soil types, Nutrients, *Soil moisture, Soil water, Soil texture, Crop response, *Nitrogen, *Phosphorus, *Sulfur, Barley, Farm

Identifiers: Ammonium nitrate.

Low protein concentration has been observed in alfalfa herbage grown on Gray Wooded Luvisol soils, particularly in cool, wet years. Nutrient deficiencies of N, P, and S also occur on these soils. The objectives of this experiment were to determine how soil moisture and soil type interact with amendments to increase yield and change N, P, and S concentrations in alfalfa herbage grown in the greenhouse. Three Gray Wooded Luvisols, typic Cryoboralf (Arborfield clay, Garrick clay loam, Mollic Cryoboralf, and Waitville loam) and one Dark Gray Luvisol soil (Nipawin sandy clay loam) times two soil moisture tensions (100 and 151 millibars) were main treatments. Amendments of cattle manure, sedge peat, and wheat straw were applied on subplots at 2.5% of soil weight. Additional subplots of a control and ammonium nitrate were added. Yield of alfalfa was significantly related to moisture use. Moisture use by alfalfa was higher with cattle manure incorporated in the heavier textured Garrick clay loam and Arborfield clay soils than for other amendments or soil types. The manure treatment applied to Garrick clay loam and Arborfield clay soils under low soil moisture tension produced the highest herbage yields. (Skogerboe-Colorado State) W77-11942

LEAF CONDUCTANCE RESPONSE TO HUMIDITY AND WATER TRANSPORT IN PLANTS.

California Univ., Riverside. Dept. of Plant A. F. Hall and G. J. Hoffman

Agronomy Journal, Vol. 68, No. 6, p 876-881, November-December 1976. 6 fig, 23 ref.

Descriptors: Stomata, *Humidity, *Leaves, Photosynthesis, Transpiration, Vapor pressure, Plant physiology. Identifiers: *Leaf conductance, Leaf water, Sun-

flowers, Pinto beans, Leaf water potential.

Stomatal response to humidity is a potentially important adaptive characteristic. The possibility that stomata may respond to humidity indepen-dently of changes in bulk leaf water status was tested. Also the basis for reported differences in leaf water potential response to transpiration was investigated. Simultaneous measurements of in situ leaf water potential, transpiration, and net photosynthesis were made in controlled environ-ments using sunflower and pinto bean. Responses of leaf conductance and leaf water potential to changes in ambient humidity and root medium water potential were determined. (Skogerboe-Colorado State) W77-11943

RELATIONSHIP BETWEEN NITROGEN ANAL-YSIS OF SOYBEAN TISSUES AND SOYBEAN YIELDS,

Kentucky Univ., Lexington. Dept. of Agronomy. U. R. Pal, and M. C. Saxena. Agronomy Journal, Vol. 68, No. 6, p 927-932, November-December 1976. 4 fig, 2 tab, 12 ref.

Descriptors: *Nitrogen, Nutrients, *Soybeans, Crop response, Fertilization. Identifiers: Seed yields.

In order to determine the applicability of N analysis of plant tissues as a diagnostic tool for N nutrition, it is essential to study the N status of soybean plants under varying N supply. Field experiments were conducted to determine the effect of N fertilization at the rates of 0, 25, 50, 100, and 200, and 300 different plant parts of nodulating (inoculated and uninoculated) and non-nodulting isolines of 'Clark' and 'Harosoy' soybeans at various stages of growth and to correlate the N status of soybean plants with yields. (Skogerboe-Colorado State) W77-11944

LONG-TERM RESIDUAL FERTILITY AND CURRENT N-P-K APPLICATION EFFECTS ON SOYBEANS,

Georgia Experiment Station, Experiment.
F. C. Boswell, and O. E. Anderson.
Agronomy Journal, Vol. 68, No. 2, p 315-318,
March-April 1976. 2 fig, 6 tab, 19 ref.

Fertilizers, *Soybeans, *Fertilization, *Nitrogen, *Phosphorus, *Potassium, Legumes, Crop response, Crop production Identifiers: Residual fertilizers.

Soybean yield response to currently applied fertilizers, especially N, has been erratic while responses to residual P and K have been more consistent. This study was conducted to determine if residual N-P-K fertilizers applied over a period of years to other non-leguminous crops would influence soybean fertilizer requirements. Soybeans were planted on a Rarden sl soil where plots had received the same rates of P and K for 13 years. Previous N levels were 56 or 112 kg/ha, depending on the crop. Since legumes had not grown on the area for at least 16 years, significant responses to 56 kg/ha of N occurred each year at the high level of P and K. A greater yield response occurred from the P application than from K. The fertilizer times year interaction effects on yield was greatest for P as compared to N or K interactions when fitted to a regression model equation. The highest rates of N-P-K resulted in significantly larger soybean seed, better quality (seed index), and higher crude protein content than low N-P-K rates or control plots. Crude protein was inversely related to total oil content. Even though relatively high levels of P and K were applied to certain plots for 16 years and crop residues remained on the soil surface each year, high levels of extractable (double acid) P or K were not found in the soil. (Skogerboe-Colorado State) W77-11945

SALINITY EFFECTS ON NITROGEN USE BY WHEAT CULTIVAR SONORA,
Soil Testing Labs., Junagadh (India).
K. L. Jadav, E. F. Wallihan, R. G. Sharpless, and

Agronomy Journal, Vol. 68, No. 2, p 222-226, March-April 1976. 3 fig, 4 tab, 7 ref.

Descriptors: *Nitrogen, Fertilizers, Fertilization, Nutrients, *Wheat, *Salinity, Saline soils, Crop production, Crop response.

The importance of N nutrition to fulfilling the high production potential of some semidwarf wheat cultivars under irrigation culture raises problems of balance between N and salinity. Inasmuch as growth may be limited in salt affected soils, thereby reducing total N requirement, the usual rates of fertilizer application may be excessive and thus contribute to the salinity problem. This study was 'Sonora 64' wheat was done to measure the effects of salinity and stand density on plant growth and grain yield, to estimate N uptake in relation to salimity and the stage of plant develop-ment, and to evaluate leaf-N as a basis for diag-nosing the N status of the plant. (Skogerboe-Color of Secretary 1997) do State) W77-11946

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

ESTIMATING EVAPORATION AND TRANSPIRATION FROM A ROW CROP DURING IN-COMPLETE COVER,

COMPLETE COVER, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. C. B. Tanner, and W. A. Jury. Agronomy Journal, Vol. 68, No. 2, p 239-243, March-April 1976. 2 fig, 2 tab, 25 ref.

Descriptors: Model studies, *Evapotranspiration, *Evaporation, *Transpiration, Potatoes, Lysimeters, Crop response, Crop production, ters, Crop

In order to model the evapotranspiration (ET) from a crop with incomplete cover, the evaporation (E) is estimated separately from the transpira-tion (T) since E and T usually do not vary propor-tionately. Our objective was to develop and test an ET model based on the 'potential' E and T esti-mates that are consistent with the potential ET estimate. When E is less than the potential E (the falling rate phase), it is estimated by two approaches based on E falling as the square root of t; however, the model assumes transpiration is at the 'potential' rate. ET estimates during cover development of potato for 2 years were compared with lysimeter measurements. The standard error of estimate varied from 0.40 to 0.94 mm/day depending on the method for estimating E. The mate of cumulative ET for 4 weeks varied from the lysimeter a maximum of 1 cm in 9.7 cm ET. (Skogerboe-Colorado State) W77-11947

NUTRIENT UPTAKE BY CORN AND GRAIN SORGHUM SILAGE AS AFFECTED BY SOIL TYPE, PLANTING DATE, AND MOISTURE

Tennessee Univ., Knoxville. Dept. of Plant and Soil Science.

H. A. Fribourg, W. E. Bryan, G. M. Lessman, and D. M. Manning.

Agronomy Journal, Vol. 68, No. 2, p 260-263, March-April 1976. 4 tab, 6 ref.

Descriptors: *Corn(Field), *Grain sorghum, *Soil moisture, *Soil water, Tennessee, Nutrients, Nitrogen, Phosphorus, Potassium, Calcium, Manganese, Fertilizers, *Soil types, Moisture content.

Few data have been published on whole-plant nutrient removal by silage crops as influenced by soil types and species. In order to quantify nutrient removals by corn and grain sorghum silage crops, early (30 April-15 May) and late (2-12 June) plantings of 'Funk G-4831' corn and 'AKS 614' sorghum were grown in 1969 in 34 environments on 12 soil types, two soils at each of six locations in Tennessee. Non-irrigated plots of the two plantings were grown on all soils, and irrigated plots were added to five of the soils. The corn was harvested for silage when 80 to 90% of the kernels were dented, and grain sorghum when the oldest seeds were in the soft dough stage. Tissue samples were collected and analyzed for N, P, K, Ca, and Mg. Total seasonal uptake was calculated by multiplying percent composition of each element by dry matter yield/ha. Corn silage yields ranged from about 6 to 28 metric tons/ha, and sorghum silage about 6 to 28 metric tons/ha, and sorghum silage yields ranged from about 7 to 18 metric tons/ha. Nutrient uptake generally increased linearly with yield. Mean total uptake of N, P, K, Ca, and Mg were, for corn silage, 192, 28, 144, 39, and 37 kg/ha; and, for grain sorghum silage, 169, 26, 143, 40, and 35 kg/ha, respectively. (Skogerboe-Colorado) W77-11948

WATER TRANSPORT IN WHEAT PLANTS IN THE FIELD, Commonwealth Scientific and Industrial Research

Organization, Canberra (Australia). Div. of Environmental Mechanics.

O. T. Denmead, and B. D. Millar. Agronomy Journal, Vol. 68, No. 2, p 297-303, March-April 1976. 5 fig, 5 tab, 27 ref.

*Wheat, Descriptors: *Transpiration. *Evapotranspiration, Water vapor, Model studies. Identifiers: Leaf water potential

Most previous studies of water transport in crops have been based on simplified models of plant anatomy and canopy transpiration. Usually changes in the water potential of a particular leaf have been related to the water loss from the whole canopy. We present a more detailed analysis of plant water transport which accounts for the spatial distribution of water flows and transpiration losses throughout the canopy, and use it to esti-mate flow resistances in different segments of the pathway. Micrometeorological measurements of the flux densities of water vapor in the canopy were used to infer water fluxes through roots, stem sections, leaves, and ears of wheat plants in the field. Simultaneous measurements of soil and leaf-water potentials permitted calculation of flow resistances in roots, stems, and leaves. The study shows clearly how the water loss from one part of the canopy influences the development of water potentials in other parts and points up the difficulties of simplified transport models. (Skogerboe-Colorado State) W77-11949

GROWTH AND MINERAL COMPOSITION OF RICE AT VARIOUS SOIL MOISTURE TENSIONS AND OXYGEN LEVELS,

Louisiana State Univ., Baton Rouge. Dept. of

W. H. Patrick Jr, and W. J. Fontenot. Agronomy Journal, Vol. 68, No. 2, p 325-329, March-April 1976. 9 fig, 16 ref.

Descriptors: *Rice, *Crop production, Crop response, *Soil moisture, Soil water, Manganese, Iron, Phosphorus, *Oxygen. Identifiers: Soil colun

The better growth of rice in a flooded soil as compared to an upland soil has been attributed to the reducting conditions caused by submergence. No study has been carried out, however, in which the effects of the soil moisture status has been separated from the effect of the oxidation-reduction conditions of the soil. In the study reported here, the effect of soil oxidation-reduction conditions on early growth and mineral composition of lowland rice was determined by growing plants in artificially packed soil columns maintained under different soil moisture tension and oxygen conditions. Since soil aeration is largely governed by the moisture status of the soil, this study was designed to separate these effects by subjecting the rice plant to different aeration conditions while at the same time attempting not to limit moisture supply.

In one experiment different redox conditions were established by maintaining soil columns at soil moisture tensions rangiang from 0 to 80 cm during growth of the plants. In a second experiment plants were grown at soil oxygen levels of 0, 3, 8, and 12% while soil moisture was maintained at 10 cm moisture tension. Vegetative growth of rice was greater under reduced conditions than under oxidized conditions in both experiments. The P concentration of the plant was much higher under reduced conditions than under oxidized condi-tions. Reduced conditions increased the solubility of P, Fe, and Mn in the soil although no consistnet effect of reducing conditions on plant uptake of Fe and Mn was observed. (Skogerboe-Colorado W77-11950

EFFECT OF INCREASING FOLIAGE AND SOIL REFLECTIVITY ON THE YIELD AND WATER USE EFFICIENCY OF GRAIN SORGHUM,

Volcani Inst. of Agriculture Research, Bet-Dagan (Israel). Div. of Agricultural Meteorology. G. Stanhill, S. Moreshet, and M. Fuchs. Agronomy Journal, Vol. 68, No. 2, p 329-332, March-April 1976. 1 fig, 3 tab, 5 ref. Descriptors: *Grain sorghum, Crop production, *Crop response, Soils, Water utilization. Identifiers: *Soil reflectivity, *Foliage.

The effect of increasing foliage and soil reflectivity on vield and water use efficiency of grain Sorghum crops grown under arid conditions with stored water only, was studied during 3 years of randomized block field experiments. Suspensions of kaolin were sprayed on the soil and/or foliage at different growth stages to select the most effective placement and timing for the treatment. Soil-only applications were ineffective in increasing yields but canopy sprays resulted in an additional yield of 446 kg/ha, or 11% over the unsprayed controls, averaged over the 3 years of experimentation. The averaged over he Syeans of experimentation. In most effective period for foliage sprays started seven weeks after seedling emergence and ended 10 days later, immediately before the panicles emerged. During this period, known to be critical for Sorghum grain yield response to water status, the yield response averaged 2 kg grain/1 kg kaolin applied. Neither the total seasonal water use nor the rate of soil water depletion was affected by the foliage reflectance treatment. It is concluded that under arid conditions, kaolin suspensions sprayed twice on the foliage of unirrigated grain Sorghum crops during the prepanicle-emergence stage shows promise as an effective method of increasing grain yield. (Skogerboe-Colorado State) W77-11951

NON-UNIFORM INFILTRATION UNDER POTATO CANOPIES CAUSED BY INTERCEPTION, STEMFLOW, AND HILLING,

Wisconsin Univ., Madison. Dept. of Soil Science. P. G. Saffigna, C. B. Tanner, and D. R. Keeney. Agronomy Journal, Vol. 68, No. 2, p 337-342, March-April 1976. 4 fig, 2 tab, 38 ref.

Descriptors: *Sprinkler irrigation, Irrigation practices, Irrigation effects, *Infiltration, *Potatoes, Leaching, Soil water, Deep percolation, Model studies

It is generally assumed that infiltration of sprinkler irrigation and rainfall under potato is uniform. However we observed non-uniform infiltration beneath the hills of sprinkler-irrigated potatoes grown of Plainfield loamy sand (Typic Udipsamment; sandy, mixed, mesic). The objective of this field study was to determine the effects of foliage interception and hilling on non-uniform infiltration, since concentrating water in local zones would increase deep drainage and nitrogen leaching. To do this we traced the rainfall and ir-rigation infiltration pattern with Rhodamine WT dye and collected the stemflow in stem collars. Throughfall of rainfall, the soil water content, and soil water tension also were measured. From 20 to 46% of the irrigation and from 4 to 23% of the rainfall on the canopy flowed down the stems. Stemflow increased the soil water content around the stems and moved Rhodamine dye deep beneath the soil surface. Deep movement of dye beneath the furrows was caused by runoff from the hills and by leaf drip from the outer foliage. The results obtained suggest that irrigation and fertilizer management could be improved by taking this non-uniform infiltration pattern into account. Smaller irrigations should improve water use efficiency and minimize nitrate leaching. Further, evaluation of solute movement by soil sampling should consider the spatial variation introduced by the non-uniform infiltration. Finally, predictive leaching models should account for non-uniform infiltration. (Skogerboe-Colorado State) W77-11952

NITROGEN NUTRITION AND YIELD OF SU-GARCANE AS AFFECTED BY N-SERVE, Weeds (M. J.) and Associates, Dublin (Ireland).

Agronomy Journal, Vol. 68, No. 2, p 343-346, March-April 1976. 4 fig, 3 tab, 13 ref.

Descriptors: *Sugarcane, Fertilizers, Fertilization, Nitrogen, Irrigation effects, Irrigation practices, Nitrification, *Nutrients, *Crops response. Identifiers: *Nitrification inhibition.

Very few experiments have been conducted to evaluate N-Serve formulated with N fertilizer for sugarcane. N-Serve when formulated with N-fertilizer increased sugarcane yields in the Philippines and in Louisiana but failed to do so in Puerto Rico and in Mauritius. In view of the relatively few exments conducted with N-Serve for sugarcane and the conflicting nature of the results, a pot ex-periment in drums and a field experiment were conducted to study the effect of N-Serve formutated with solid ammonium sulfate (AS) on sugar-cane ('HJ 5741') yield, leaf N content, tillering, and on soil N. In the pot experiment two soils, a clayey loan and a loamy sand were used combined with a high and low irrigation treatment. There were two rates of AS with and without N-Serve. A control treatment was also included. N-Serve was applied at 2.5% of the weight of AS. In the field exappared as 2.0 of the weights As. in the feature periment on a sandy clay there were three rates of AS with and without N-Serve. A control treatment was also included. N-Serve was applied at a flat rate of 24 liter/ha. (Skogerboe-Colorado State) W77-11953

COMPARISON OF MODIFIED MONTMORIL-LONITE TO SALTS AND CHELATES AS CAR-RIER FOR MICRONUTRIENTS FOR PLANTS: L SUPPLY OF COPPER, ZINC, AND MAN-

GANESE, Hebrew Univ., Rehovoth (Israel). Dept. Soil and

For primary bibliographic entry see Field 3C. W77-11954

COMPARISON OF MODIFIED MONTMORIL-LONITE TO SALTS AND CHELATES AS CAR-RIER FOR MICRONUTRIENTS FOR PLANTS: IL SUPPLY OF IRON,

Hebrew Univ., Rehovoth (Israel). Dept. of Soil and Water Science.

For primary bibliographic entry see Field 3C. W77-11955

INFLUENCE OF NITROGEN, NARROW ROWS, AND PLANT POPULATION ON COTTON YIELD AND GROWTH,

Council for Scientific and Industrial Research,

Kumasi (Ghana). Dept. of Agronomy. S. E. Koli, and L. G. Morrill. Agronomy Journal, Vol. 68, No. 6, p 897-901, November-December 1976. 3 fig, 8 tab, 18 ref.

Descriptors: *Cotton, *Crop response, *Fertilization, Fertilizers, *Nitrogen, Plant population, *Crop production. Identifiers: Row spacing.

Narrow row planting of cotton has the potential for improving yield and production efficiency. Fertilizer needs and other production technology for narrow row cotton have received little atten tion, especially the nitrogen (N) requirement. The objective of this study was to ascertain if N fertilizer, narrow row, and high population, has any effect on growth and yield of dryland cotton. The relationship between petiole NO(-)3(-)N at various stages of development and yields was also investigated. Row spacing (25, 51, and 76-cm), plant populations (123,550 and 173,000 plants/ha), and N rate (0, 45, and 90 kg/ha) variables were placed in a factorial arrangement of a randomized, complete Tactoral arrangement of a randomized, complete block design with four replications. Low N treatments (45 kg/ha) produced no significant change in yield, but higher N rates reduced yield significantly. The 25 and 51-cm row spacings produced significantly higher yield than 76-cm rows. The range of plant populations used did not materially affect yield, but there was a significantly N-popu lation interaction. Narrow rows reduced plant height. NO(-)3(-)N levels in petioles increased with

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increased N rate, being highest at the square stage of plant growth and decreasing sharply at the flower and boll stages. There was no significant correlation between petiole NO(-)3(-)N and yield. Narrow row cotton can result in higher yield and is especially of interest where the length of growing season is not optimum. (Skogerboe-Colorado State) W77-11956

NITRIFICATION INHIBITOR WITH FALL-AP-PLIED VS. SPLIT NITROGEN APPLICATIONS

PLIED VS. SPLIT NITROGEN AFFICATIONS FOR WINTER WHEAT, Georgia Univ., Experiment. Dept. of Agronomy. F. C. Boswell, L. R. Nelson, and M. J. Bitzer. Agronomy Journal, Vol. 68, No. 5, p 737-740, Sep-tember-October 1976. 1 fig. 5 tab, 11 ref.

Descriptors: *Nitrification, Nutrients, Fertilization, *Nitrogen, Crop response, Crop production, *Wheat, Georgia, Soil analysis.
Identifiers: Soil fertility.

Since numerous small grain producers desire to make fall application of efficient levels of N for maximum yields, studies are needed to determine the efficiency of fall-applied N (with and without an inhibitor) vs. split N applications. Field studies were conducted at two locations each year over a 3-year period with the objective of evaluating the response of wheat to N rates, time of application, and effect of a nitrification inhibitor on soils of dif-ferent characteristics. Yields, tissue concentrations of various elements, grain analyses, and soil NH4(-) and NO3(-)N were evaluated. Splitting the N, 28 kg/ha in the fall and 56 kg/ha topdressed in the spring, was superior to applying all the N in the fall. The inclusion of the nitrification inhibitor, 2chloro-6-(trichloromethyl) pyridine (N-Serve), with ammonium sulfate in the fall at the rate of 84 kg/ha did not influence yields or N levels in the tis-sue or grain. The inhibitor had no effect on elements other than N. Although the nitrification inhibitor influenced the retention of the NH4(-)N in the soil until the January sampling, this retention was not evident for either soil at the March sampling. Therefore, we concluded that the N applied as a part of the complete fertilizer at the rate of 28 or even 84 kg/ha in the fall is inadequate for maximum wheat yield in either the coastal plain or piedmont regions of Georgia. A nitrification inhibi-tor applied with the ammonium sulfate was ineffective in preventing nitrification of the ammonium nitrogen or to increase yields. (Skogerboe-Colorado State) W77-11957

SULFUR AND NITROGEN REQUIREMENTS OF SUGARCANE, Hawaii Univ., Honolulu. Dept. of Agronomy and

Soil Science. R. L. Fox.

Agronomy Journal, Vol. 68, No. 6, p 891-896, November-December 1976. 9 fig, 3 tab, 25 ref.

Descriptors: *Sugarcane, *Nitro Nutrients, Fertilizers, Fertilization *Nitrogen, *Sulfur, Identifiers: Nitrogen-sulfur ratio.

The internal S requirement of sugarcane is not well defined and there are no published data on the external SO1-S requirements. The objectives of this study was to provide data on sulfur distribution and N:S ratios in sugarcane. Sugarcane was grown in solution cultures and in potted soil material which provided several concentrations and ratios of NO3 and SO1 in solution. External S and N requirements were estimated from plots of yield vs. SO4 or NO3 concentrations in solution cultures and in artificial soil solutions. The external S requirement at age 35 days was about 9 ppm. After 70 days the requirement was about 5 ppm when N was adequately supplied. The external S requirement for early growth was 0.36% S in the whole plant and 0.24% for leaf blades 3 through 6. When plants were 70 days old, 0.10% S in leaf blades or 0.08% S inleaf sheaths was sufficient. Sulfur-deficient, field-grown sugarcane 18 months old contained 0.075% S in leaves 3 through 6 and 0.072% S in the corresponding leaf sheaths. Sulfur fertilized sugarcane contained 0.138% and 0.232% for the same tissues. Ratios N:S differed for various tissues of the same plant. Distribution of S in the plant may be a valuable tool for assessing the S status of sugarcane. When S is deficient, old leaf blades contain more S than corresponding leaf sheaths, and blades and sheaths of leaves 3 to 6 contain about equal concentrations of S. Good S nutrition was associated with an elevated concentration of S in leaf sheaths as compared with leaf blades. (Skogerboe-Colorado State)

STOMATAL RESPONSE TO LEAF WATER POTENTIAL AS AFFECTED BY PRECONDI-TIONING WATER STRESS IN THE FIELD, Texas A and M Univ., College Station. Dept. of

Soil and Crop Science. J. C. Thomas, K. W. Brown, and W. R. Jordan. Agronomy Journal, Vol. 68, No. 5, p 706-708, September-October 1976. 4 fig, 13 ref.

Descriptors: *Grain sorghum, *Cotton, Crop response, Moisture stress, *Stomata, Crop production, Irrigation, Irrigation effects, Irrigation ractices. Soil water. Leaves. Identifiers: *Leaf water potential.

Previous research has shown that stomatal response to decreasing soil water potential of chamber-grown sorghum and cotton posure to previous water stress. This work was undertaken to determine if stomatal response of field-grown plants is also altered by previous water stress. Stoneville 213 cotton was grown in the field under movable rainshelters and was subjected to three movable rainsacters and was subjected to three treatments: control-well watered, one period of water stress, and two periods of water stress. After this preconditioning period, all plants underwent a final stress during which stomatal response to leaf water potential was measured. The periods of preconditioning water stress were characterized by decreased cumulative growth as measured by leaf area per plant. Leaf areas for the control, one soil water stress plants, and two soil water stress plants were 5,200, 2,200, and 1,200 sq cm, respectively. Lower stomates of preconditioned field-grown plants remained open to lower leaf water potentials (-28 to -30 bars) during the final stress than those of plants which were not preconditioned (-22 bars). These results were similar to those found previously on chamber-grown plants which had been exposed to more frequent but shorter stresses. The 6 to 8 bar adjustment in leaf water potential vs. stomatal resistance as a result of previous water stress indicates a need for caution in interpreting data from plants of unknown water stress history. (Skogerboeunknown wate Colorado State) W77-11959

APPLICATION NEMATICIDE POROUS SUBSURFACE IRRIGATION TUBING, Georgia Univ., Athens. Dept. of Agricultural En-

J. L. Chesness, J. R. Dryden, and U. E. Brady Jr. Transactions of the American Society of Agricultural Engineers, Soil and Water, p 105-107, Special Edition 1976. 6 fig, 5 ref.

Descriptors: *Nematocides, *Nematodes, Subsurface irrigation, *Irrigation practices, Irrigation systems.

Identifiers: Drip irrigation, Trickle irrigation,

*Vydate, *Nema cur.

The low translocation characteristics of Nemacur would not make it suitable for field application through a porous tube applicator. Vydate how-ever, does offer some definite possibilities for field application through a porous tube applicator. Nematode populations are generally the highest in

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the surface or upper soil region. A lethal Vydate concentration (according to its manufacutres) is 5 ppm. This minimal concentration in the Vydate test was attained as far out as 60 cm horizontally (from the applicator) at a 23 cm depth. With multiple laterals on a 120 cm spacing the overlap effect in the water distribution pattern should provide a 5 ppm or greater Vydate concentration in a major portion of the soil profile. The above 'field application inference' is just that: an inference based on laboratory tests. The affects upon the nematicide distribution patterns of high initial soil water contents and reduced initial concentrations must be field evaluated before the inference label can be removed. (Skogerboe-Colorado State)

APPLICATION OF A TWO-VARIABLE MITSCHERLICH FUNCTION IN THE ANALYSIS OF YIELD-WATER-FERTILIZER RELATIONSHIPS FOR CORN,

Iowa State Univ., Ames. Center for Agricultural and Rural Development.

R. W. Hexem, V. A. Sposito, and E. O. Heady. Water Resources Research, Vol. 12, No. 1, p 6-10, February 1976. 4 fig, 3 tab, 6 ref.

Descriptors: *Model studies, Fertilizer, *Fertilization, *Corn(Field), Colorado, Kansas, simulation analysis, Crop response, Nutrients, Crop production. Identifiers: *Mitscherlich models.

Variations of models developed by E.A. Mitscherlich in the early part of this century are periodically used for estimating input-output relationships for plants. Mitscherlich's work focused on a single variable. While these exponential models incorporate features of theoretical appeal, the procedures for quantifying the models are relatively complex when two or more independent variables are included. In fits of Mitscherlich and polynomial forms to yield-water-fertilizer data for corn grown under experimental conditions in Colorado and Kansas, test statistics for the polynomial forms are as good as or better than those for the more complex Mitscherlich models. (Skogerboe-Colorado State)

SUBSURFACE AND FURROW IRRIGATION EVALUATION FOR BEAN PRODUCTION, Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.

Paniavi Univ., Shiraz (Iran). Dept. of Irrigation. A. R. Sepaskhah, S. A. Sichani, and B. Bahrani. Transactions of the American Society of Agricultural Engineers, Soil and Water, p 1089-1092, Special Edition, 1976. 4 fig, 3 tab, 19 ref.

Descriptors: *Subsurface irrigation, *Furrow irrigation, Irrigation, Irrigation practices, *Beans, Crop production, Water conservation. Identifiers: Drip irrigation, Trickle irrigation.

The water use efficiency, yields of beans and economic feasibility of furrow and subsurface irrigation systems were compared in field experiments. Subsurface irrigation required 55 percent less water to produce a yield of beans comparable to that obtained with furrow irrigation. Water use efficiencies of 81.9 and 37.5 kg of beans per cm of water were obtained for the treatments irrigated with subsurface and furrow irrigation systems, respectively. Spacing for subsurface irrigation laterals was obtained from a laboratory experiment and was 84 percent of the theoretical spacing. If the usable life of the porous pipe can be extended to 3 yr, the price of the subsurface system could be comparable to that of the furrow irrigation system when water cost is \$0.0135/cu m. (Skogerboe-Colorado State)

RELATIONSHIP BETWEEN POTATO YIELD AND OXYGEN DIFFUSION RATE OF SUBSOIL, Department of Agriculture, Frederiction (New Brunswick). Research Station. G. R. Saini. Agronomy Journal, Vol. 68, No. 5, p 823-825, September-October 1976. 1 fig, 1 tab, 24 ref.

Descriptors: *Potatoes, Crop response, *Crop production, Soil physical properties, Soil compaction, Organic matter, Soil properties, Soil moisture, Field capacity, Oxygen.

Identifiers: *Oxygen diffusion rate(Soils).

Numerous studies in the past have been made of the effects of soil compaction on potato yield by deliberately packing the soil in small experimental plots. Since information obtainable from such experiments has limited value in the economic assessment of crop production of an area, a study was conducted on 10 different farmer's fields to find out which soil physical property (or a com-bination of properties) may best define the prevailing productive capacity of a soil for potatoes. Various soil properties (stones, sand, silt, clay, bulk density, penetrometer readings, and orgainc matter) were measured according to the methods given by Black (1965) at a depth of 20 to 28 cm (8 to 11 inches) where the compact soles usually occur. Oxygen diffusion rate, however, was determined at a moisture content of field capacity by the platinum microelectrode method (Lemon and Erickson, 1952) using a rate meter manufactured by Jensen Instruments, Tacoma, Washington. Stepwise multiple regression analysis of potato yields of cultivar 'Netted Gem' and the soil properties indicated that oxygen diffusion rate of subsoil was one single factor which highly correlated with marketable yield (r = +0.82). The correlation coefficient was significant at the 1% level of probability. Further addition of other properties did not improve the r value significantly. The study indicates the oxygen diffusion rate of subsoil is useful criteria to diagnose the prevailing physical condition of the soil which in turn, could be related to the relative productive capacity of soil for potato production in New Brunswick, Canada. (Skogerboe-Colorado State) W77-11963

EVAPOTRANSPIRATION AND WATER USE EFFICIENCY BY SOYBEAN LINES DIFFERING IN GROWTH HABIT.

IN GROWTH HABIT,
Fort Valley State Coll., Ga. Div. of Agriculture.
B. P. Singh, and E. N. Whitson.
Agronomy Journal, Vol. 68, No. 5, p 834-835, September-October 1976. 2 fig. 4 ref.

Descriptors: *Soybeans, *Evapotranspiration, *Crop response, *Canopy, Eddies, Crop production, Water vapor, Air circulation, *Water utilization.

Identifiers: Canopy morphology, Water use efficiency.

Determinate and indeterminate soybeans differ in canopy morphology due to a difference in their growth habits. Canopy morphology may affect receipt and loss of radiation, air circulation, and eddy turbulence. These factors may in turn in fluence heat and water vapor transfer, thereby possibly influencing plant water use. The objective of this study was to determine the effects of soybean growth habits on evapotranspiration and water use efficiency. The daily evapotranspiration rate for both lines was maximum at the early reproductive stage. Water extraction by both lines extended to a 122-cm soil depth, the lowest depth measured. The total evapotranspiration by the determinate line was 41.2 cm as compared to 39.2 cm for the indeterminate line. The difference in growth habits amounted to only a small fraction of the total evapotranspiration. The determinate line by utilizing only 5.6% more water. This accounted for an 18.1% greater water use efficiency of the determinate line. These values suggest that growth habits affect water use efficiency primarily by controlling grain yield. (Skogerboe-Colorado State)

YIELDS AND SUGAR CONTENT OF SUGAR-BEETS AS AFFECTED BY DEFICITY HIGH-FREOUENCY IRRIGATION.

Agricultural Research Service, Prosser, Wash. Western Region.

western region. D. E. Miller, and J. S. Aarstad. Agronomy Journal, Vol. 68, No. 2, p 231-234, March-April 1976. 2 fig, 5 tab, 7 ref.

Descriptors: *Sprinkler irrigation, *Sugar beets, Crop response, Crop production, Evapotranspiration, Irrigation effects, irrigation practices, Irrigation engineering, Irrigation systems, Operating costs, Installation costs.

Identifiers: *High frequency irrigation.

Installation and operating costs of irrigation systems are related to system capacity and amount of water applied. If sprinkler systems can be designed for less than usual peak evapotranspiration rates, initial costs will be less. If less water is applied, operating expenses will decrease. Previous work indicated that sugarbeets can be grown satisfactorily under high-frequency deficit irrigation (daily or more often at rates less than evapotranspiration) with soil water supplying part of the irrigation deficit. A field study was conducted, using solid-set sprinklers, with the objective of determining the minimum amount of irrigation water that must be applied during peak use periods to avoid reduction in sugar yields. Treatments involved irrigation each morning at rates equivalent to various proportions of evaporation the previous day from a Class A Weather Bureau pan. The soil indicates that with soils with adequate available waterholding capacity and crops that will tolerate deficit high-frequency irrigation, systems can be designed for less capacity and total water application may be reduced. Soil water will be used to reduce the irrigation deficit. (Skogerboe-Colorado State)

MOISTURE USE EFFICIENCY OF DRYLAND CROPS AS INFLUENCED BY FERTILIZER USE, IV. GRAIN LEGUMES,

Central Arid Zone Research Inst. Jodhpur (India). Dry Farming Research Main Centre.

R. P. Singh, and Y. S. Ramakrishna.

Annals of Arid Zone, Vol 15, No 4, p 285-296,

December, 1976, 8 tab, 4 ref.

Descriptors: *Dry farming, *Moisture availability, *Crop response, *Legumes, *Beans, *Fertilization, Rainfall, Fertilizers, Agronomic crops, Crop production, Wheat, Water supply, Consumptive use, Phosphorus, Soybeans, Arid lands, Application methods.

Identifiers: India, Mung beans, Moth beans, Chick peas.

Studies were conducted on the response of various grain legumes to fertilizer use under rainfed conditions at two locations in India. The objective was to study the relative moisture use efficiency of pulse crops as influenced by different levels of phosphorus and different methods of application. Additional experiments were conducted on five grain legumes, both with fertilized and unfertilized treatments, in a low rainfall area of Jodhpur, India. The relative performance of these crops under different rainfall conditions is discussed. The results are presented and show that under Delhi conditions pigeon pea exhibited the highest moisture use efficiency, followed by mung beans. Soybean and chick peas responded to lower doses of fertilizer and to the placement method of fertilizer application, while mung beans responded to higher levels of fertilizer. At Jodhpur mung beans, moth beans, and cluster beans exhibited higher moisture use efficiency and responded well to fertilizer application. (Jamail-Arizona) W77-11987

EFFECT OF IRRIGATION AND FERTILIZER ON YIELD AND QUALITY OF SEED COTTON

(GOSSYPIUM HIRSUTUM L.) IN WESTERN

Central Arid Zone Research Inst. Jodhpur (India).

Annals of Arid Zone, Vol 16, No 1, March 1977, p 67-72, 2 tab, 1 fig, 2 ref.

Descriptors: *Crop response, *Cotton, *Irrigation effects, *Fertilization, *Soil-water-plant relationships, Fibers(Plant), Arid lands, Application methods, Crop production, Water requirements, Flowering, Seeds, Irrigation, Fertilizers, Irrigation

practices.
Identifiers: Short duration cotton, Double cropping, *Rajasthan(India) branching.

A field experiment was conducted for two con-secutive seasons in India on a short duration seed cotton in order to obtain information in its response to irrigation and fertilizer application. Yield increased with increasing irrigation. Fertilization application did not significantly increase yield. The best quality cotton fibre was obtained when irrigations were applied at the stages of branching, flowering, and seed formation. (Ullery-W77-11989

METHOD AND TIMING OF NITROGEN APPLI-CATION IN RAINFED BAJRA,

Central Arid Zone Research Inst. Jodhpur (India). S. D. Singh.

Annals of Arid Zone, Vol 15, No 4, December, 1976. p 305-312, 1 fig, 2 tab, 5 ref.

*Fertilization. *Fertilizers. Descriptors: Application methods, *Crop response, *Nitrogen, Foliar application, Timing, Water requirements, Arid lands, Ureas, Leaching, Topsoil, Crop production, Soil-water-plant relationships, Planting management.

Identifiers: Bajra, Rajasthan, *India.

To determine the time and method of applying nitrogen for efficient fertilizer use on hybrid bajra (variety HB3), as well as to determine the opmum dose, field experiments were conducted on a farm at Jodhpur during the rainy seasons from 1968-1970. Treatments of various basal, topdressing, and foliar spray doses of N fertilizer supdressing, and foliar spray doses of N fertilizer sup-plied through urea were tested. Results indicated 30 kg/ha of N can be added at sowing and 15 kg later as topdressing during normal rainfall years, or as a spray in moderately dry seasons. In dry seasons only 30 kg/ha basal N without later top-dressing is recommended. On light soils under con-ditions of uncertain rainfall, foliar spray can have some advantages over topdressing. (Ullery-Arizona) W77-11990

YIELD AND MOISTURE USE PATTERN OF RABI CROPS GROWN UNDER RAINFED CON-DITIONS OF EASTERN U.P.,

Banaras Hindus Univ., Varanasi (India). Dryland

Agriculture Research Project. R. A. Singh, O. P. Singh, H. C. Sharma, and M.

Singh. Annals of Ariz Zone, Vol 16, No 1, March 1977. p 61-66, 2 tab, 2 ref.

Descriptors: *Dry farming, *Consumptive use, *Soil-water-plant relationships, *Crop production, Crops, Plant growth, Root distribution, Crop response, Water requirements, Arid lands, Barley, Wheat, Agriculture, Soil moisture, Grains(Crops), Legumes. Identifiers: Linseed, Gram, India.

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An investigation was carried out to evaluate grain ction of varieties of wheat, barley, gram, and linseed under dryland conditions in eastern Utah Pradesh. Field experiments were conducted during three consecutive rabi seasons. Average rain yield showed gram to be the top yielder, fol-owed by barley, wheat, and linseed. Higher gram yield resulted from its deeper root penetration and longer crop duration. While gram used the most stored soil moisture, barley was the most efficient user of soil moisture. (Ullery-Arizona)

DRIP IRRIGATION OF PEANUTS (ARACHIS HYPOGAEA L.) ON A STUDY SOIL, Volcani Inst. of Agricultural Research, Bet-Dagan

(Israel).

(Islaet). S. Feldman, and A. Hartzook. Annals of Arid Zone, Vol 15, No 4, p 301-304, December, 1976. 2 fig, 2 tab, 7 ref.

Descriptors: *Irrigation efficiency, *Irrigation systems, *Peanuts, *Crop production, Crop presponse, Irrigation, Agriculture, Arid lands, Water conservation, Soil types, Loam, Sands, Sprinkler irrigation.
Identifiers: *Israel, *Drip irrigation.

Because of a serious shortage of water for irriga-tion in Israel, the application of water to agricultural crops using drip irrigation has become widespread. This study evaluates the effect of two drip irrigation rates on the yield and quality of pe-anuts grown on a sandy loam soil in the southwestern region of the northern Negev desert in Israel. Experiments were conducted and the results presented show that a significant saving in water application by the drip method could be ob-tained without lowering yields. Since peanuts are produced extensively in Israel and there is a demand on the world market for the high quality produced there, the drip irrigation method merits further investigation in terms of water savings, weed and disease control, and labor efficiency. (Jamail-Arizona) W77-11995

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. For primary bibliographic entry see Field 6C. W77-11997

A NOTE ON THE IRRIGATION AND FERTILI-TY LEVELS ON THE YIELD AND NUTRIENT UPTAKE OF DWARF BARLEY CULTIVAR

M. R. Bajpai, and H. S. Mertia. Annals of Arid Zone, Vol 16, No 1, March, 1977, p 153-156, 3 tab.

Descriptors: *Irrigation effects, *Fertilization, *Nutrient requirements, *Irrigation, *Soil-water plant relationships, *Barley, Crop production, Crop response, Grains(Crops), Nitrogen, Nutrients, Arid lands, Fertilizers. Identifiers: *Nutrient uptake, Dwarf barley cultivar RDB-1.

A field experiment was conducted on a dwarf cul-As the experiment was conducted on a dwarf cutvar of barley with irrigation at 20, 35, and 50% ASM and nitrogen levels at 30, 60, 90, and 120 kg/ha alone and with 40 kg/ha each of P and K. The grain, straw, and dry matter yield all decreased with decreasing irrigation levels. Uptake of N, P205, and K20 increased with higher irrigation. rigation levels. Irrigation at 50% ASM produced significantly higher grain yield. Significant differences in straw yield, but not grain yield, were noted between 35 and 20% ASM treatments. Significant differences in straw yield, but not grain yield, were noted between 35 and 20% ASM treatments. nificant differences in grain and straw yields were found for increasing levels of nitrogen to 90 kg/ha, but a reduction in grain yield occurred between 90 and 120 kgN/ha. With increasing levels of nitrogen, applications of PK increased straw and grain yields. Nutrient uptake followed a trend similar to that of production, increasing up to 90 kg/ha level of nitrogen, increasing with the appli-cation of PK, and decreasing uptake with the highest dose of 120 kgN/ha with or without PK.

Maximum yield and nutrient uptake were recorded with the treatment combination of 50% ASM with 90 kgN/ha supplemented with PK. (Ullery-Arizona) W77-12002

NOTE ON DIVERGENCE IN SOME VARIETIES OF WHEAT GROWN UNDER RAIN-FED CON-

DITION, Indian Agricultural Research Inst., New Delhi. Div. of Genetics. S. P. Yadav, J. R. Sharma, N. N. Roy, and O. P.

Indian Journal of Agricultural Sciences, Vol 44, No 11, p 778-780, November 1974. 1 tab, 4 ref.

Descriptors: *Plant morphology, *Crop response, *Wheat, *Plant growth, *Soil-water-plant relationships, *Variability, Height, Planting management, Moisture stress, Plant breeding, Flowering, Plant physiology, Crop production, Genetics. Identifiers: *Divergence, Clusters.

A study was conducted to evaluate the relative degree of divergence under changes from irrigated to rain-fed conditions in 32 new strains of wheat in 3 height categories (tall and D and D2 semidwarfs), using Mahalanobis's D3 statistic. The D3 values representing divergence among any 2 varieties taken for all morphological character combined ranged from 5.45 between 'Chhoti Lerma' and 'HD 1493' to 1257.40 between 'HD 1669' and and 'HD 1493 to 127.40 between 'HD 1507', indicating substantial diversity in the material. The 32 strains were grouped into 13 clusters, with the pedigree relationship of genotypes having little influence on clustering pattern. Intra-cluster divergence is described; inter-cluster divergence ranged from 6.9 to 33.9. The alleles for flowering duration and neight nau consumering fluence on the clustering pattern. No genotypes flowering duration and height had considerable inwith different flowering periods or plant heights were under the same group, but those with the same flowering duration often formed more than one cluster. Results indicate considerable variability between and within groups for flowering time (early, medium and late) and plant height; thus, breeding procedure is more responsible for divergence than is pedigree relationship. Crosses between certain varieties might improve yield components and seedling characteristics desirable for conditons of moisture stress. (Jahns-Arizona) W77-12004

CHANGES IN TOTAL N, ORGANIC MATTER, AVAILABLE P, AND BULK DENSITIES OF A CULTIVATED SOIL 8 YEARS AFTER TAME PASTURES WERE ESTABLISHED, South Dakota State Univ., Brookings. Dept. of

E. M. White, C. R. Krueger, and R. A. Moore. Agronomy Journal, Vol. 68, No. 4, p 581-583, July-August 1976. 2 tab, 9 ref.

Descriptors: *Nitrogen, *Organic matter, *Phosphorus, *Bulk density, *Soil investigations, *South Dakota, Pastures, Alfalfa.

Cultivated Williams loam soils in north-central South Dakota were sampled after pastures were established and 8 years later so that the effect of the pastures on soils could be studied from analythe pastures on sous could be studied from analysis in the laboratory. Pastures were seeded to Russian wildrye, crested wheatgrass, or a mixture of smooth bromegrass, intermediate wheatgrass, and a pasture alfalfa. Soil N and bulk densities increased as available P decreased in the 8 years. The soil organic matter increased under all pastures, but it was small. The increases in organic matter, decreases in available P, and increases in saturated-clod bulk densities were different in the saturaceu-coo oulk densities were different in the various pastures. Total N and organic matter in creased about 0.001 and 0.02% per year, respectively, which is slower than the rate of decrease caused by cultivating the original grassland soils. (Skogerboe-Colorado State)
W77-12115

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

EVALUATION OF AN ELECTRONIC FOLIOMETER TO MEASURE LEAF AREA IN CORN AND SOYBEANS, California Univ., Davis. Dept. of Land, Air and

Water Resources.

For primary bibliographic entry see Field 7B. W77-12118

A SYSTEM AND PROGRAM FOR MONITOR-ING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION, Nebraska Univ., Lincoln. Dept. of Agricultural

For primary bibliographic entry see Field 7B. W77-12120

YIELD AND NITROGEN UTILIZATION BY RICE AS AFFECTED BY METHOD AND TIME OF APPLICATION OF LABELLED NITROGEN. Louisiana State Univ., Baton Rouge. Dept. of

Agronomy. K. R. Reddy, and W. H. Patrick, Jr. Agronomy Journal, Vol 68, No 6, p 965-969, November-December 1976. 1 fig, 6 tab, 20 ref.

Descriptors: *Nitrogen, Fertilization, Nutrients, Fertilizers, *Rice, Crop response, *Crop produc-

Identifiers: Ammonium sulfate, Rice production.

Recent increases in the cost of N fertilizer make it important to examine methods of improving the utilization of fertilizer N by lowland rice. The objective of the present investigations was to compare the effects of different methods and times of N application on yield and utilization of N by lowland rice. Field experiments using labelled fertilizer N were carried out during 1974 and 1975 utilizing different times and methods of applica-tion of ammonium sulfate on small field plots. Fertilizer N was applied either by deep placement at the beginning of the season or at one or more times during the growing season as surface application. Relative contributions of native soil N and fertilizer N sources to plant uptake were followed during the growing season, and total uptake of native soil N and fertilizer N by rice was determined at harvest. (Skogerboe-Colorado State)

COMPARISON OF SIMULATED AND MEASURED NITROGEN ACCUMULATION IN BUR-LEY TOBACCO,

Texas Tech Univ., Lubbock. Dept. of Agronomy. R. E. Zartman, R. E. Phillips, and J. E. Leggett. Agronomy Journal, Vol 68, No 2, p 406-410, March-April 1976. 4 tab, 13 ref.

Descriptors: Fertilizers, *Fertilization, *Nitrogen, *Tobacco, Nutrients, *Simulaton analysis, Model studies, Root development.

Efficient utilization of N fertilizers by plants is important for scientific, economic, and environmen-tal reasons. The objectives of this experiment were (1) to experimentally evaluate the simultane-ous mass flow and diffusion of NO3(-)N to tobac-co roots and (2) to compare the calculated accumu-lation of N in tobacco, the root of which was assumed to be a perfect sink for NO3(-)N (Model I), or flux of NO3(-)N into the root which was assumed to be proportional to concentration of NO3(-)N at the root surface (Model II), to measured accumulation of N in Burley tobacco grown under field conditions. Model I overestimated accumulation of N an average of 52%. Model II underestimated accumulation an average of 26%. The proportionality constant, k, assumed by Model II, was found to be 4.27 times 10 to the minus 7th power sq cm sec-1 throughout the growing season, except when moderate plant water stress was experienced by the plant. The data show that the accumulation of N by Burley tobacco was proportional to the concentration of NO3(-)N in the soil solution. (Skogerboe-Colorado State) W77-12122

SPRINKLER APPLICATION OF P AND ZN FERTILIZERS, Nebraska Univ., North Platte. Dept. of Agrono-

my. G. W. Hergert, and J. O. Reuss.

Agronomy Journal, Vol 68, No 1, p 5-8, January-February 1976. 2 fig, 7 tab, 9 ref.

Descriptors: *Phosphorus, *Zinc, *Fertilizers, Fertilization, Nutrients, *Sprinkler irrigation, Irrigation practices, Irrigation water, *Corn(Field).

The rapid development of sprinkler irrigation in the Great Plains has stimulated interest in applying fertilizers in sprinkler irrigation water. Sprinkler application and conventional preplant application effects of P and Zn fertilizers on the dry matter yield, nutrient content, and grain yield of corn were compared in 1968 and 1969. Both years preplant P treatments produced a significantly higher dry matter yield during the first 5 weeks of the growing season. No significant difference existed between P treatments after this time. In 1969 plants which received preplant P and Zn contained slightly higher concentrations of P and Zn than the plants which received sprinkler P and Zn. Grain yields were significantly increased by Zn applica-tion in 1968 but not in 1969. In 1968 on a Nunn clay loam soil the sprinkler-applied P did not move below a 4-5 cm depth. On a Haxtun loamy sand in 1969 sprinkler-applied P moved to a depth of approximately 18 cm. Sprinkler-applied Zn moved to a maximum depth of 5 cm on both soils. (Skogerboe-Colorado State) W77-12123

CORN GROWTH AS AFFECTED BY AMMONI-UM VS. NITRATE ABSORBED FROM SOIL.

Potash Inst., Columbia, Mo. Dept. of Agronomy. D. W. Dibb, and L. F. Welch. Agronomy Journal, Vol 68, No 1, p 89-93, January-February 1976. I fig, 8 tab, 14 ref.

Descriptors: *Ammonium, *Nitrates, *Corn(Field), Crop response, Leaching, Denitrification, Greenhouse experiments, *Absorption.

The effect of NH4 on corn growth in a soil medium is of interest because of the possibility of sig-nificantly decreasing leaching and denitrification losses of applied N by preserving N in the NH4 form. The objective of this investigation was to determine growth and nutrient content of corn plants when the principal form of N was either NH4 or NO3. Corn, grown in the greenhouse in a soil medium, was allowed to absorb N as either NH4 or NO3. A chemical nitrification inhibitor and different souces of added N were used to manipulate the form of N available for absorption.
The maximum amount of N absorbed as NO3 was estimated as the difference between the NO3 content of fallow and cropped pots at harvest. Plants estimated to have absorbed at least 95% of their N as NH4. (Skogerboe-Colorado State) W77-12124

SUGARBEET YIELD AND QUALITY AS AF-FECTED BY NITROGEN LEVEL,

Agricultural Research Service, Kimberly, Idaho. ake River Conservation Research Center J. N. Carter, D. T. Westermann, and M. E. Jensen. Agronomy Journal, Vol 68, No 1, p 49-55, January-February 1976. 5 fig. 4 tab. 15 ref.

Descriptors: *Sugar beets, *Nitrogen, Nutrients, *Fertilizers, Fertilization, Crop response, Idaho, Crop production.

This study was conducted, under several climatic and soil conditions, to determine the effect of N level on sugarbeet yield and quality and to further develop and refine both soil and tissue test methods for predicting N fertilizer needs for efficient refined sucrose production. Previous studies indicate that N fertilizer needs for maximum sucrose production may be predicted by consider-

ing yield potential and all N sources. Sugarbeets ing yield potential and all N sources. Sugarbeets were grown under field conditions at N fertilizer levels varying from 0 to 448 kg n/ha on six sites throughout southern Idaho to determine root yield, sucrose percentages, sucrose yield, impurity index, and plant N uptake in relation to the residual NO3(-)N, mineralizable N, fertilizer N, and petiole NO3(-)N. These experiments demonstrated that the N fertilizer resid of sucrebets strated that the N fertilizer needs of sugarbeets can be determined by relating the root yield poten-tial to the masured residual NO3(-N) plus a mea-sured or estimated mineralizable N level for an area. Optimum N level from all available soil and fertilizer sources has been found to vary between 5 to 6 kg/metric ton of beet roots produced. (Skogerboe-Colorado State)

IRRIGATION SCHEDULES FOR SUGARBEETS ON MEDIUM AND COARSE TEXTURED SOILS IN THE NORTHERN GREAT PLAINS,

North Carolina State Univ., Raleigh. Dept. of Soil

D. K. Cassel, and A. Bauer. Agronomy Journal, Vol 68, No 1, p 45-48, January-February 1976. 1 fig, 3 tab, 5 ref.

Descriptors: *Sugar beets, Soils, Soil investiga-tions, Soil water, Soil moisture, Irrigation, Irriga-tion water, Tensiometers, *North Dakota, Great

Identifiers: *Irrigation scheduling.

An increase in the access to irrigation water in the Northern Great Plains is effecting large increases in the acreages of soils being irrigated. Much of this water is being applied to medium to coarse-textured soils which hold a maximum of 7 to 12 cm of available water in a 152 cm deep profile. An investigation was conducted in the field to devise a system, using tensiometers, to schedule the application of irrigation water to sugarbeets growing on these soils. Tensiometers were installed at various soil depths, and irrigation water was applied with a small plot irrigator when soil moisture tension reached a predetermined level. One tensiometer located at the 45 cm depth was equally effective in scheduling as two tensiometers, one positioned at a depth of 30 and one at 61 cm. Maximum crude sugar yields of 8.4 to 8.8 metric tons/ha were obtained in 1971 and 1973, respectively. Total water use efficiency was 0.15 to 0.16 metric tons of crude sugar/ha per cm. The maximum irrigation water use efficiencies were 0.32 and 0.36 for 1971 and 1973, respectively. It is concluded that 56 to 62 cm of water, well distributed throughout the growing season, is sufficient for sugarbeet production in southeastern North Dakota in a year of normal growing season Colorado State) (Skogerboetemperatures. W77-12126

NITROGEN RELEASE FROM ISOBUTY-LIDENE DIUREA: SOIL PH AND FERTILIZER PARTICLE SIZE EFFECTS,

Illinois Univ. at Urbana-Champaign. Dept. of Horticulture

T. D. Hughes. Agronomy Journal, Vol 68, No 1, p 103-106, January-February 1976. 6 fig, 6 ref.

Descriptors: Nitrogen, Nutrients, Fertilizers, Fertilization, Soil moisture, Soil properties, Soil investigations, *Ureas, Nitrification.
Identifiers: *Nitrogen release(Soil).

Soil-isobutylidene diurea (IBDU) mixtures were incubated to determine the effects of soil pH and IBDU particle size on N release patterns. Such in-IBDU particle size on N release patterns. Such in-formation is needed for predicting rates and frequencies of application. All incubations were conducted at a temperature of 21 plus or minus 0.5C and 28 plus or minus 2% soil moisture. Evidence was obtained for excluding urea-N con-centrations from calculations of N recovery, tus all recoveries were based on concentration

(NH(+)4 + NO(-)3)(-)N. Nitrogen release patterns from 0.7 to 0.8 mm IBDU particles in soil at initial pH's of 5.7, 6.8, and 7.7 were determined. After four weeks of incubation, the amount of N released was equivalent to one-third of the IBDU-N for soil at pH 5.7, however, lesser amounts were released in soil at pH's 6.8 and 7.7. Differences in N release were due to differences in NH(+)4(-)N concentrations, whereas concentrations of NO(-)3(-)N were not related to soil pH throughout the 10-week incubation period. (Skogerboe-Colorado State) W77-12127

NUTRIENT UPTAKE BY RUSSET BURBANK POTATOES AS INFLUENCED BY FERTILIZA-

Oregon State Univ., Corvallis. Dept. of Soil

T. L. Jackson, and G. E. Carter.

Agronomy Journal, Vol 68, No 1, p 9-12, January-February 1976. 5 tab, 11 ref.

Descriptors: Nutrients, Fertilizers, *Fertilization, *Potatoes, *Zinc, *Manganese, Oregon.

Zinc and Mn deficiencies have been observed frequently in potatoes grown on eastern Oregon soils developed under arid conditions. The study was designed to evaluate effects of band and broadcast applications of ammonium sulfate (AS) and monocalcium phosphate (MCP) on yield and uptake of P, Zn, and Mn by Russet Burbank potatoes grown on calcareous mineral soil defi-cient in N, P, Zn, and Mn. Potatoes were grown under field conditions, harvested and evaluated. Fertilizer treatments were broadcast before planting and rototilled or banded at planting. Petiole samples to identify nutrient concentrations were taken when tubers were 2 cm in diameter. Whole plants were harvested 3 weeks later to measure nutrient uptake. Petiole concentrations and plant uptake of both Zn and Mn were greater when AS was banded than when broadcast, with or without band applications of Zn and Mn. (Skogerboe-Colorado State) W77-12128

RESPONSES OF THREE PEANUT CULTIVARS

TO GYPSUM, Georgia Coastal Experiment Station, Tifton. Dept. ronomy

M. E. Walker, T. C. Keisling, and J. S. Dresler. Agronomy Journal, Vol 68, No 3, p 527-528, May-June 1976. 2 tab, 12 ref.

Descriptors: *Peanuts, Calcium, *Gypsum, Crop response, Soil investigations, Nitrogen.

The differential response of peanut cultivars to soil applications of Ca has been established for many years. Recent research reports, however, have indicated that peanut cultivars respond similarly to Ca application. This may result in part from new peanut cultivars differing in their response to Ca. Experiments were therefore conducted on a low Ca soil to measure responses of ducted on a low Ca soul to measure responses of three commonly grown peanut cultivars to soil-ap-plied Ca. Results from this experiment show that gypsum had no effect on yield or sound mature kernels of Florunner peanuts. Florunner peanuts produced higher yields and grades than Florigiant or NC-Fla 14, regardless of treatments. Gypsum application to Floriging and NC-Fla 14 resputts in application to Florigiant and NC-Fla 14 peanuts increased yields, sound mature kernels, and extra large kernels. In general, gypsum increased the % oil in all cultivars. Florigiant contained less oil than the other cultivars. Nitrogen content of the seed of the other cultivars. Nitrogen content of the seed of all cultivars was reduced by gypsum application. These data indicate that on low Ca soils Florunner peanuts can produce higher yields and quality with or without gypsum, while Florigiant and NC-Fla 14 need gypsum fertilization to increase yield and improve quality. (Skogerboe-Colorado State) W77-12129

NITROGEN AVAILABILITY TO WHEAT AS AFFECTED BY DEPTH OF NITROGEN PLACE-

MENT, Nebraska Univ. Panhandle Station at Scottsbluff.

L. A. Daigger, and D. H. Sander. Agronomy Journal, Vol 68, No 3, p 524-526, May-June 1976. 4 fig, 10 ref.

Descriptors: *Nitrogen, *Wheat, Fertilization, Fertilizers, Crop production, Nebraska, Soil moisture.

The availability of residual N in the root zone greatly influences the amount of N fertilizer greatly influences the amount of N lettinger required to optimize winter wheat yields. In order to determine the availability of N at different depths in the root zone, an N placement study was conducted in the field on two soils in western Nebraska, a deep alluvial fine sandy loam and a loess-derived silt loam. Ammonium nitrate was placed on the soil surface and at depths of 30, 60, 90, 120, and 150 cm. Wheat plants were harvested six times during the spring growing season to determine N uptake. Soil moisture was at field capacity in the spring when experiments were established. While N uptake tended to decrease as the depth of N application increased, total dry matter production was not affected by depth of N placement. Wheat plants easily obtained N placed at depths up to 150 cm. The results indicate winter wheat roots are mostly established during the fall growing season and are in a position to provide N early in the spring for rapid above ground growth. (Skogerboe-Colorado State) W77-12130

DEFOLIATION AND FERTILIZER NITROGEN EFFECTS ON NITRATE-NITROGEN PROFILES IN MAIZE

Minnesota Univ., St. Paul. Dept. of Agronomy and

Plant Genetics.
D. R. Hicks, and R. H. Peterson.

Agronomy Journal, Vol 68, No 3, p 476-478, May-June 1976. 3 fig, 10 ref.

Descriptors: *Corn(Field), Hail, *Nitrates, *Nitrogen, Fertilization.

Corn vegetative tissue remaining after hail damage is often utilized for forage. Environmental stresses may cause levels of nitrate-nitrogen in plant tissue that are toxic to ruminants. This study was conducted to determine the effect of leaf blade removal (simulated hail damage) and N fertiliza-tion of the soil on the NO-3-N profile of corn fodder. Leaf blade removal of 0, 50, 100% was imposed at tasseling on the corn hybrid 'Dekalb XL45A' grown in soil fertilized with either 115 or 230 kg N/ha. Plants were sampled approximately weekly for 6 weeks after defoliation. (Skogerboe-Colorado State) W77-12131

EVALUATION OF SULFUR-COATED UREA (SCU) APPLIED TO IRRIGATED POTATOES

AND CORN, Wisconsin Univ., Madison. Dept. of Soil Science. E. A. Liegel, and L. M. Walsh. Agronomy Journal, Vol 68, No 3, p 457-463, May-June 1976. 4 fig, 5 tab, 9 ref.

Descriptors: *Potatoes, *Corn(Field), Nitrogen, Fertilizers, Fertilization, Wisconsin, Leaching, Irrigation, Irrigation effects, *Ureas.

Excessive rates of soluble N fertilizers are sometimes used on irrigated sands in Central Wisconsin to compensate for loss of some of the applied N by leaching. Use of a slow-release form of N or several small applications of a soluble N fertilizer may eliminate some leaching and subsequent loss of NO3-N. This study was designed to evaluate these methods of reducing N losses by measuring yield and recovery of applied N by potato tubers and corn grain. Supplemental N treatments applied each year for 3 years were as follows: (1) urea in a siagle or split application, (2) SCU impregnated with a wax coating, and (3) SCU with only a sulfur coating. (Skogerboe-Colorado State) W77-12132

SALT TOLERANCE OF PROSTRATE SUMMER CYPRESS (KOCHIA PROSTRATA), Agricultural Research Service, Riverside, Calif.

Salinity Lab. For primary bibliographic entry see Field 3C. W77-12133

SEED COATING, PRECISION PLANTING, AND SPRINKLER IRRIGATION FOR OPTIMUM STAND ESTABLISHMENT,

California Univ., Davis. Dept. of Water Science

and Engineering.
F. E. Robinson, and K. S. Mayberry.
Agronomy Journal, Vol 68, No 4, p 694-695, July-August 1976, 2 tab, 7 ref.

Descriptors: Lettuce, Sugar beets, *Sprinkler irrigation, Germination, Carrots, Onions, Seeds, Irrigation effects, Irrigation practices, production. Identifiers: *Seedling.

The legal prohibition of the short handled hoe in California has forced a change in the conventional practice of surplus-seedling and subsequent thinning to achieve optimum stands with lettuce and ar beet crops. Precision placement of coated I was evaluated as an alternate method of stand establishment with five crops grown on Meloland sandy clay loam with sprinkler irrigation. Germination was compared to emergence of coated seed. Emergence was: carrot 86%, onion S5%, and sugar beet 71%. Single lettuce seeds 38 cm apart had 89% stand, paired seeds 2.5 cm apart on 38 cm intervals and thinned had 97%. (Skogerboe-Colorado State)

SOIL WATER DEPLETION-YIELD RELA-TIONSHIPS OF IRRIGATED SORGHUM, WHEAT, AND SOYBEANS,

Southwestern Great Plains Research Center, Bushland, Tex.

J. T. Musick, L. L. New, and D. A. Dusek Transactions of the American Society of Agricultural Engineers, Soil and Water, p 489-493, Spcial Edition 1976. 4 fig, 11 ref.

Descriptors: *Soil water, *Soil moisture, Irrigation, Irrigation effects, *Grain sorghum, *Wheat, *Soybeans, Irrigation practices. Identifiers: Irrigation scheduling, *Soil water depletion

Approximately 4 billion cu m of groundwater is pumped annually to irrigate sorghum, wheat and soybeans grown in the fine-textured soils of the soybeans grown in the inne-textured soils of the Southern High Plains. Declining groundwater storage and the high costs of pumping necessitate that water be applied only when it is needed to prevent appreciable yield reductions. Relation-ships between soil water depltion and grain yields provide a rational basis for scheduling irriga based on soil water in the major root zone. (Skogerboe-Colorado State)
W77-12137

SCHEDULING CENTER PIVOT SPRINKLER

RRIGATION SYSTEMS FOR CORN PRODUC-TION IN EASTERN COLORADO, Agricultural Research Service, Fort Collins, Colo. D. F. Heermann, H. R. Haise, and R. H. Mickelson.

Transactions of the American Society of Agricultural Engineers, Soil and Water, p 284-287, Special Edition 1976. 6 fig, 1 tab, 2 ref.

Descriptors: Scheduling, Irrigation systems, *Sprinkler irrigation, Irrigation, *Corn(Field), Colorado, Soil moisture, *Crop production.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

Identifiers: *Center pivot irrigation, *Irrigation scheduling.

The United States Department of Agriculture irrigation Scheduling Program was modified to provide multiple irrigation forecast dates for use with center pivot sprinkler irrigation systems. Four Eastern Colorado cooperators used the program and developed confidence in the computer output mailed to them weekly. Each cooperator used the information slightly differently. Some cooperators started the irrigation system at the earliest recommended date, whereas others started their systems between the 'start' and 'no later than' date. The two dates provided (a) the 'start' date when the soil water depletion was equal to the irrigation depth, and (b) the 'no later than' date when the system must be started so as not to deplete 50 percent of the available soil water at any location in the field. The cooperator who participated for 3 years reported that his yields had definitely increased due to the scheduling program. Thus, the scheduling program certainly can be beneficial to center pivot irrigation by increasing yields and conserving energy, water and fertilizer (in the deep percolation). (Skogerboe-Colorado State) W77-12138

USE OF K-4 POLYMER IN INCREASING ANTIEROSIVE SOIL STABILITY IN IRRIGATION

FURROWS, (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Soil Melioration.

Menoration. M. S. Kuznetsov, V. Ya. Grigor'ev, K. P. Paganyas, and R. Saatov. Biol Nauki (Mosc) 19(1), p 131-134, 1976.

Descriptors: *Polymers, *Irrigation, *Cotton, *Water consumption, *Soil erosion.

Identifiers: *K-4 polymer.

Spraying of gray-soil irrigation furrows in cotton fields with K-4 polymer in aqueous solution in doses of 20 and 40 kg/ha increased the permissible water consumption by 5-9 and 6-12 times, respectively, according to erosion conditions. The effectiveness of the preparation increased with a decrease in the slope in the 0.04-0.01 range. The permissible water consumption was 1.1-1.6 times higher for 40 kg/ha than for 20 kg/ha; however, the effectiveness per preparation unit was signifi-cantly lower for the higher dose. The 20 kg/ha dose was recommended for industrial use.-Copyright 1977, Biological Abstracts, Inc. W77-12153

A NEW APPROACH FOR ESTIMATING IR-RIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION, Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados. E. V. Palacios, and J. C. Day. Water Resources Bulletin, Vol. 13, No. 4, p 709-719, August 1977. 1 tab, 2 fig, 5 ref.

Descriptors: *Irrigation systems. *Canals. **Economic feasibility, Methodology, Irrigation districts, Mexico, Statistical methods, Water management(Applied), Networks, Flow, Costs, Benefits, Estimating, Evaluation, Water supply, Water delivery, Regression analysis, Equation Mathematical models, Systems analysis. Maintenaucal models, systems analysis. Identifiers: *Conveyance efficiency, *Operating rules, Linear model, Conveyance losses, Operational losses, Shadow prices, Lining canals, Water releases, Operational efficiency.

A new methodology for estimating conveyance efficiency within irrigation systems is presented. Based on statistical analysis of daily water releases from the source of supply and deliveries to the farmers in an irrigation district in Mexico, a linear model is obtained for estimating conveyance efficiency and two component factors. One of these factors points out the relative importance of the operational losses (i.e., losses due to water management), and the other shows the importance of the fixed losses which can be attributed to the average flow through the canal network without variations. Next, an analysis of the expected benefits and costs accruing from system improvement permits derivation of a decision rule which may be used in analyzing the economic feasibility of lining in-place canals. Results show that conveyance efficiency may be significantly increased by improving the operating rules in an irrigation system, this being the cheapest way of attaining the improvement. However, since many variable factors may affect the economic feasibility of lining canals, careful studies should be made regarding infiltration rate measurements, cost of lining, days of effective operation per year of each canal, etc., before making decisions regarding the lining of the canal in question. (Bell-Cornell)

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRA-TION, SOIL MOISTURE, AND SOIL SALINITY

REGIMES, Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering. For primary bibliographic entry see Field 5B.

W77-12171

NITROGEN ACCUMULATION AND TRANSLO-CATION IN CORN GENOTYPES FOLLOWING

Guelph Univ. (Ontario). Dept. of Soil Science E. G. Beauchamp, L. W. Kannenberg, and R. B. Hunter.

Agronomy Journal, Vol. 68, No. 2, p 418-422, March-April 1976. 3 fig, 5 tab, 6 ref.

Descriptors: *Nitrogen, Fertilizers, *Fertilization, Nutrients, Corn(Field), Crop response, Crop production.
Identifiers: *Nitrogen translocation(Corn).

The potential for improvement of N utilization in corn can depend on the existence of genotypic differences. Accordingly studies were conducted to determine if N translocation from the leaves and stalk to the car during the period immediately following silking depended on the genotype. In 1970, the N concentration of individual leaf blades, stalk, and developing ears of four inbreds was determined at the silking stage and 14 and 28 days after silking. In a similar experiment in 1971, using bulked leaf blade samples, three of the inbreds plus their Fl hybrids were analyzed for N at silking and 24 days after silking. In 1970, the apparent translocation of N from individual leaf blades differed considerably depending on the inbred. Sig-nificant differences in N concentration in either the stalks or developing ears occurred among genotypes in 1970 and 1971. Appreciable differences were found in the apparent propensity of the inbreds to translocate N to the developing ear. In 1970, apparent N translocation during the 14 to 28 day period was greater than during the 14 to 28 day period was greater than during the first 14 days following silking. The inbreds differed between years with respect to apparent N translo-cation suggesting a genotype times environment interaction. (Skogerboe-Colorado State) W77-12174

FIELD STUDIES OF THE CONDUCTANCE OF WHEAT LEAVES AND TRANSPIRATION, Commonwealth Scientific and Industrial Res

Organization, Canberra (Australia). Div. of Environmental Mechanics.

O. T. Denmead, and B. D. Millar. Agronomy Journal, Vol. 68, No. 2, p 307-311, March-April 1976. 4 fig, 9 ref.

Descriptors: *Wheat, *Transpiration, Stomata,

Identifiers: Water potentials, Leaf conductance, Canopy transpiration.

Light and water stress appear to be the main fac-tors determining the short-term variation of sto-matal aperture in the field but their joint influences dom been studied in the natural environment. We have examined the effects of the irradi-ances and water potentials of leaves of field-grown wheat plants on their conductances for water vapor and on canopy transpiration. Water potentials were measured by thermocouple psychrometry or estimated from water flow rates and plant resistances. Conductances were measured with a diffusion porometer or calculated from the proposed of the programments inside the from meteorological measurements inside the canopy. The latter data also permitted calculation of leaf irradiances and transpiration rates. (Skogerboe-Colorado State) W77-12175

NITRATE-N AND TOTAL N CONCENTRATION RELATIONSHIPS IN SEVERAL PLANT SPE-

National Fertilizer Development Center, Muscle

G. L. Terman, J. C. Noggle, and C. M. Hunt. Agronomy Journal, Vol. 68, No. 4, p 556-560, July-August 1976. 5 fig, 2 tab, 9 ref.

Descriptors: *Nitrates, *Nitrogen, Nutrients, Greenhouse experiments, Corn(Field), Greenhouse experiments, Co Phosphorus, Potassium, Crop response. Identifiers: *Nitrate-nitrogen.

Accumulation of NO3-N in plants is important in regard to plant N nutritional status, in the formation of NO2-N toxic to animals and people consuming the plants, and as a producer of lethal gas in silos. This paper describes relationships between NO3-N and total N concentrations in plants grown in several greenhouse pot experiments, as affected largely by response to applied N and by continuing growth. Corn was grown in soil with 200 to 800 mg of N/pot and in nutrient solutions with 2 to 16 ppm of N. Both crops were harvested at 4-day intervals. Spinach and mustard were grown in soil with several rates of N, P, and K, and tall fescue with 1.0 and 2.0 g of N/pot. (Skogerboe-Colorado State)

DIFFUSION AND MASS FLOW OF NITRATE-

DIFFUSION AND MASS FLOW OF NITRATE-NITROGEN INTO CORN ROOTS GROWN UNDER FIELD CONDITIONS, Ministry of Agriculture, Bangkok (Thailand). Dept. of Agronomy. T. NaNagara, R. E. Phillips, and J. E. Leggett. Agronomy Journal, Vol. 68, No. 1, p 67-72, January-February 1976. 4 fig, 3 tab, 10 ref.

Descriptors: *Nitrogen, *Nitrates, *Corn(Field), Crop response, Nutrients, Fertilizers, Fertiliza-tion, *Mass flow, Model studies, *Diffusion,

Nitrate-nitrogen, the most important source of N of non-leguminous plants, is soluble in soil water and is transported to plant roots by both mass flow and diffusion. It is, therefore, important to evaluate the relative importance of each of these two mechanisms of transport of NO3(-)N to plant roots and the environmental conditions under which each is the dominant mechanism of transport. The objective of this paper was to present measure-ments of plant and soil parameters necessary for estimating accumulation of N grown under field conditions with the use of a theoretical model and to compare estimates of accumulation of N in the corn plant with measured accumulation in the plant. (Skogerboe-Colorado State) W77-12177

SUBSOIL CHISELING AND SLIP PLOWING EFFECTS ON SOIL PROPERTIES AND WHEAT GROWN ON A STRATIFIED FINE SANDY SOIL.

Agricultural Research Service, Brawley, Calif. Dept. of Soil Science.

For primary bibliographic entry see Field 2G. W77-12178

SOIL PHYSICAL CONDITIONS AFFECTING RICE ROOT GROWTH: BULK DENSITY AND SUBMERGED SOIL TEMPERATURE REGIME

Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 2G.

W77-12179

W77-11565

COMPATIBLE SEDIMENT CONTROL PRAC-TICES AND TILLAGE SYSTEMS. Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 4D. W77-12181

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ROOF DRAINAGE OF LARGE BUILDINGS IN

University of the Witwaterstand, Johannesburg (South Africa). Dept. of Civil Engineering. For primary bibliographic entry see Field 3B. W77-11555

ANALYSIS OF THE TEMPORAL BEHAVIOUR OF THE LEVEL OF LAKE MALAWI, University of the Witwatersrand, Johannesburg

(South Africa). Dept. of Geography and Environmental Science For primary bibliographic entry see Field 2H.

ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS, American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port,

Coastal and Ocean Div. For primary bibliographic entry see Field 8G. W77-11595

A METHOD OF ESTIMATING THE PROBA-BILITY OF OCCURRENCE OF SNOW WATER EQUIVALENTS IN THE UNITED KINGDOM, Office, British Meteorological Bracknell (England).

Hydrological Sciences Bulletin, Vol. 22, No. 1, p 127-142, March 1977. 9 fig, 4 tab, 19 ref, 1 append.

Descriptors: *Probability, *Estimating, *Snow, Snowmelt, Snow cover, Water measurement, Meteorology, Hydrology, Water, Mathematical studies, Water management(Applied), Foreign countries, Foreign research.

Identifiers: *Snow water equivalents, *United Kingdom, Guides.

A simple guide (shown in an appendix) was produced, which enables a water manager or engineer to make an estimate of statistics of water equivalent snow cover for return periods between S and 100 years for most places in the United King-dom. The paper described how the guide was produced. The methods described should be of help to both meteorologists and hydrologists in temperate countries with similar snow questions.
(Roberts-ISWS)

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION, Karlova Universita, Prague (Czechoslovakia). For primary bibliographic entry see Field 2E. W77-11602

A STOCHASTIC MODEL FOR THE SIMULA-TION OF DAILY FLOWS, Karlsruhe Univ. (West Germany). Institut fuer

Wasserbau III. For primary bibliographic entry see Field 2E. W77-11603

THE MONTE CARLO APPROACH TO OP-TIMIZATION OF THE OPERATION RULES FOR A SYSTEM OF STORAGE RESERVOIRS, Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.

Hydrological Sciences Bulletin, Vol. 22, No. 1, p 203-214, March 1977. 6 fig, 9 ref.

Descriptors: *Monte Carlo method, *Reservoir storage, *Resource allocation, *Reservoir operation, Systems analysis, Model studies, Mathematical models, Water resources, Hydrology, Simulation analysis. Identifiers: Optimal policy.

Development of a method which enables formulation of reservoir operation rules in a multi-reservoir water resources system was described. The method consists of three major steps: (1) development of a mathematical model of a multivariate (time and space) river flow process and generation of a synthetic input to the system, (2) development of a mathematical model of a water resources system and the simulation of its operation over the whole period of synthetic inflows (simulation coupled with one of the mathematical programming techniques), and (3) statistical analysis of the results of the simulation-optimization computations. Consecutive implementation of all steps leads to the formulation of the operation rules for all the reservoirs in the system. (Lee-ISWS) W77-11604

STUDIES ON DRAINAGE WATER OF BEHIRA GOVERNORATE: THE SUITABILITY OF EL-KHYRI GROUP DRAINS.

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst. For primary bibliographic entry see Field 3C. W77-11634

REMOTE SENSING OF WATER DEMAND IN-FORMATION. California Univ., Santa Barbara. Dept. of Geog-

raphy.
For primary bibliographic entry see Field 6D.
W77-11635

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.

Arizona Univ., Tucson. Office of Arid Lands Stu-

For primary bibliographic entry see Field 6B. W77-11637

TECHNOLOGICAL SYSTEMS IN WATER AND GRAIN STORAGE, Wunderman Foundation, New York For primary bibliographic entry see Field 6B. W77-11638

REMOTE SENSING AND DEVELOPING COUN-TRIES: POTENTIAL AND PROBLEMS IN THE TRANSFER OF TECHNOLOGY,

Clark Univ., Worcester, Mass. Graduate School of Geography.

For primary bibliographic entry see Field 6B.

W77-11639

PLANNING FOR URBAN STORMWATER CON-

Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla.

For primary bibliographic entry see Field 5G. W77-11669

ENGINEERING ANALYSIS OF WATER-DISTRIBUTION SYSTEMS,

Technion-Israel Inst. of Tech. Haifa. Dept. of Civil Engineering.

U. Shamir, and C. D. D. Howard. Journal of the American Water Works Associa-tion, Vol. 69, No. 9, p 510-514, September 1977, 1 fig, 4 ref.

distribution(Applied), techniques, Design, Descriptors: *Water Analytical techniques, Networks. Calibrations, Optimization, Operations, Control, Simulation analysis, Reservoirs, Behavior, Technology, Computers, Computer programs, Mathematical models, Systems analysis.

Identifiers: Newton-Raphson method, Jacobian matrix, Sensitivity analysis.

To bridge the gap between technological advancement and application, a nonmathematical explana-tion of modeling for analysis of water-distribution systems is given. Considered specifically is a 1966 investigation of the Boston, Massachussets water distribution system; a previous paper describes the precise mathematical formulations and gives the results of application to the Boston engineering study. Herein, a review of the previous work is given, where the Newton-Raphson technique was used to solve a set of nonlinear equations for a hydraulic network. The basic engineering engineering problems encountered in the analysis of water distribution systems are discussed: calibration, operation and control, design, and optimization. Next, the paper considers design criteria, sur-rogate models and skeletonized networks, modeling of special elements, simulation and reservoirs. and the behavior of water-distribution systems. It is concluded that the described method of solving water distribution networks is practical for en-gineering analysis. The capability to solve for a mixture of unknowns influences the way in which engineers approach distribution analysis problems and acquire field data. For evaluations of network or data modifications, sensitivity analysis is more effective than the solution itself because water distribution networks behave linearly over a practical range of operation. (Bell-Cornell) W77-11764

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER WATERSHED.

Tobacco Tax Council, Richmond, Va. For primary bibliographic entry see Field 6B. W77-11767

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES, Engineering-Science, Inc., Arcadia, Calif. For primary bibliographic entry see Field 6B. W77-11771

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT, Vrije Universiteit, Amsterdam (Netherlands). For primary bibliographic entry see Field 6A. W77-11773

DISASTER-CAUSED INCREASES IN UNIT REPAIR COST, Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 6F. W77-11777

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

LOW FLOW CRITERIA FOR DIVERSIONS

AND IMPOUNDMENTS,
Geological Survey, Menlo Park, Calif. Environmental and Safety Section.

S. L. Chiang, and F. W. Johnson.

Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 227-238, November 1976. 2 fig, 6 ref.

Descriptors: *Water management(Applied), *Diversion, *Impoundments, *Low flow, Regula-Descriptors: tion, Planning, Water resources. Identifiers: *Flow patterns.

Low flow criteria for impoundments and diversions were formulated through a multidisplinary task force are being used by the State of Pennsylvania. Watershed size, low flow yield of the stream, reservoir capacity, and water quality were considered in the formulation of the criteria. The criteria were implemented using a simple chart which provides a transition from an impoundment to a diversion. The techniques used to arrive at the chart and formula are applicable to reservoirs and diversions elsewhere. (Bell-Cronell)

PRESSURE EFFECTS ON GREAT LAKES VER-TICAL CONTROL,

National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab

For primary bibliographic entry see Field 2H.

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO.

Army Engineer District, Albuquerque, N. Mex. Prepared for City of Las Cruces, NM. June 1971, 14 p, 23 plates, 2 tab.

Descriptors: *New Mexico, *Arroyos, *Floods, *Flood data, *Peak discharge, *Nonstructural al-ternatives, Flooding, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, measurement, Flood forecasting, Historic Hoods, Flood plain, Standard Project Flood. Identifiers: Las Cruces(NM), *Alameda Arroyo(NM), *Las Cruces Arroyo(NM), Campus

Arroyo(NM), Tortugas Arroyo(NM), Flood plain

The study area includes the city of Las Cruces in south central New Mexico in the Rio Grande's Mesilla Valley. The four major arroyos of Alameda, Las Cruces, Campus, and Tortugas enter the city from the east and terminate in the low valley area of the city. All of the channel courses have been completely occupied by urban and rural development. Except for a period from May 1958 to September 1966, significant discharge records are not available for the arroyos under study. Flood data were obtained from historical documents, U.S. Geological Survey (USGS) and Soil Conservation Service (SCS) publications, and field studies. Flood profiles and flooded area maps were developed from these data. Major flooding occurs in late summer and early fall. The worst known flood occurred on September 21, 1941, discharging an estimated 2,630 cubic feet per second (cfs). Another large flood, on August 22, 1965, discharged 2,170 cfs. The Intermediate Regional Flood is expected to discharge 6,300 cfs in the Alameda Arroyo and 5,400 cfs in the Las Cruces Arroyo, while the Standard Project Flood would discharge 9,010 cfs in the Alameda Arroyo and 8,960 cfs in the Las Cruces Arroyo. The re-port's contents are intended to aid in planning the best use of flood prone lands, and nonstructural alternatives are described as a planning aid. (Nessa-NC) W77-11834

FLOOD PLAIN INFORMATION: FRANK-STOWN BRANCH JUNIATA RIVER, Army Engineer District, Baltimore, Md. Prepared for Blair County Planning Commission, Pennsylvania, July 1976. 18 p, 7 tab, 7 fig, 8 plates.

Descriptors: *Floods, *Flood profiles, *Flood data, *Flood peak, *Historic floods, *Pennsylvania, Maximum probable flood, Flood control, Flood plain, Peak discharge.

Identifiers: *Frankstown Branch Junias Branch Identifiers: *Frankstown Branch Standard River(PA), Frankstown Township(PA), 500-year

The study area involves approximately 6 miles of the Frankstown Branch of the Juniata River, which is a major tributary of the Juniata and Susquehanna Rivers. It is located in the Township of Frankstown, Pennsylvania. The upper half of the study area is mostly agricultural, while the lower half has commercial, residential and industrial developments. The only source of streamflow records is a U.S. Geological Survey (USGS) gage located 8.5 miles downstream from the study area. The gage has been maintained since 1917. Additional data sources were USGS tonormaliant tional data sources were USGS topographic sheets, 1975 field survey information on stream cross-sections and bridges, and an hydraulic analysis. Floods occur at all times of year, but the largest floods were caused by snowmelt in conjunction with rainfall, or hurricane activity. The worst flood of record occurred on March 18, 1936, discharging 47,600 cubic feet per second (cfs) and discharging 47,600 cubic feet per second (cts) and cresting at 850.4 feet, mean sea level datum (MSL) at the USGS gage. The most serious recent flood occurred on June 23, 1972, discharging 16,400 cfs and cresting at 850.2 MSL. The 500-year flood is expected to discharge 39,500 cfs, while the 100-year flood would discharge 23,500 cfs. Data from this preparation will be used to develop flood plain this report will be used to develop flood plain management records. (Nessa-NC) W77-11835

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA

Army Engineer District, Buffalo, N.Y. Prepared for Eric County, N.Y., April 1966. 48 p, 18 fig. 7 plates, 2 tab.

Descriptors: *New York, *Flood data, *Peak discharge, *Land use, *Planning, Floods, Flood flow. Indirect flood measurement. Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Ice jams, Flood plain zoning, Building codes, Zoning, Flooding, Standard Project Flood.

Identifiers: *Buffalo Creek(NY), Elma(NY), West Seneca(NY), Intermediate Regional Flood.

The study area includes the portions of the cities of Elma and West Seneca that are subject to flood-ing from Buffalo Creek. Some residential and commercial developments are on the flood plain. Flood data were obtained from stream gages, newspaper accounts, and historical documents. The main flood season is late winter and early spring and results from rainfall, snowmelt, or both. The worst flood of record occurred in June. 1937 and discharged an estimated 16,000 cubic feet per second (cfs) and crested 10.2 feet above flood stage at the site of the USGS gage at Gardenville. Recent large floods occurred in March, 1955 and March, 1956. Both floods discharged 13,000 cfs and crested 9.4 feet above flood stage. The January 1959 flood discharged 10,000 cfs, but ice jams at some locations crested flood levels higher than those of 1955 or 1956. At the Gardenville age, the Intermediate Regional Flood would discharge 16,000 cfs and the Standard Project Flood would discharge 76,000 cfs. In 1966, the Corps of Engineers determined that no flood control projects were justified in the watershed. The report describes non-structural flood control measures, including zoning, subdivision controls, and flood plain regulations. (Nessa-NC) W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA.

Army Engineer District, Buffalo, N.Y.
Prepared for Erie County, N.Y. Main Report and
Technical Appendix. October 1966. 45 p, 19 fig, 4 plates, 2 tab, append.

Descriptors: *New York, *Flood data, *Peak discharge, *Land use, *Planning, Floods, Flood-ing, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Ice jams, Flood plain zoning, Building codes. Creek(NY), Identifiers: *Cazenovia *Buffalo(NY), West Seneca(NY), Erie Coun-

The study area includes the portions of the cities of Buffalo and West Seneca that subject to flooding by Cazenovia Creek-0.7 miles in Buffalo and 5.4 miles in West Seneca. Some residential development exists on the flood plain, with a park and golf course. Pressure for development i creasing. Flood data were obtained from stream gage records and newspaper files. The main flood season occurs in late winter and early spring and is caused by snowmelt, rainfall, or both. Ice jams complicate these floods, creating higher flood stages. The worst flood of record occurred in June, 1937. Stream gage records are not available for that time. More recent floods have occurred in 1955, 1959 and 1962. The 1955 flood had a peak discharge of 13,500 cubic feet per second (cfs) at the Ebenezer gage. The Intermediate Regional Flood is expected to discharge 18,000 cfs. Flood profiles for the Standard Project Flood are not presented. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision con-trols, and flood plain regulations. Also included is a discussion of structural controls to help alleviate flooding damages for existing structures and development. (Nessa-NC) W77-11837

FLOOD PLAIN INFORMATION: ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.

Army Engineer District, Detroit, Mich. Prepared for Detroit, MI., December 1966. 20 p, 3 fig, 10 plates, 1 tab, append.

Descriptors: *Michigan, *Flood data, *Peak discharge, *Land use, Floods, Indirect flood mea-surement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Flood plain zoning, Building codes, Zoning.

Identifiers: *River Rouge(MI), Main Branch, Franklin Branch(MI), Evans Ditch(MI), Detroit(MI).

The study area includes the portions of the Detroit metropolitan area which are subject to flooding by the River Rouge Main Branch, Evans Ditch, and Franklin Branch. Some residential and commercial developments are on or adjacent to the flood plains. Flood data were obtained from U.S. plains. Flood data were obtained from U.S. Geological Survey (USGS) stream gages and topographic maps, precipitation records, newspaper accounts and historical documents. The worst flood of record, equivalent to the 70 year flood, occurred on April 5, 1947, and discharged 10,700 cubic feet per second (cfs) in the River Rouge Main Branch, 1,300 cfs in Evans Ditch, and 1,450 cfs in the Franklin Branch. The respective Stan-dard Project Floods for these streams would be 41,500 cfs, 5,000 cfs, and 5,600 cfs, respectively. Although intended for informational purposes, this report describes non-structural control mea-sures, including zoning, subdivision regulations, building codes, and mortgage restrictions. (Nessa NC) W77-11838

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN. Army Engineer District, Detroit, Mich. Prepared for City of Farmington, MI., February 1963. 26 p, 6 fig, 2 plates, 2 tab, append.

Descriptors: *Michigan, *Floods, *Flood data, *Peak discharge, *Non-structural alternatives, Planning, Flood flow, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Flood protection, Flood plain zoning, Building codes, Zoning, Standard Project Flood.

Identifiers: *Upper River Rouge(MI), Farming-ton(MI), Novi(MI), Quakerton(MI), Detroit(MI).

The study area involves the Upper River Rouge watershed, including the cities of Farmington, Novi, and Quakerton, which are suburbs of Detroit. Some high value residential developments exist on the floodplain. Flood data were obtained from U.S. Geological Survey (USGS) stream gages and topographic maps, rainfall records, newspaper files, and historic documents. The major flood season is late winter and early spring and results from rainfall, snowmelt, or both. The greatest recorded flooding occurred on April 6, 1947. Stream gaging records are not available for this flood. A flood having a 70 year recurrence interval is expected to discharge 1,500 cubic feet/second (cfs), which is equivalent to the 1947 flood. The Standard Project Flood would ischarge 5,500 cfs. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision regulations, building codes, and mortgage restrictions. (Nessa-NC)

FLOOD PLAIN INFORMATION: ATLANTA, TEXAS: BLACK BAYOU AND TRIBUTARIES. Army Engineer District, New Orleans, L.A. Prepared for Atlanta, Texas, January, 1974, 33 p, 18 fig. 22 plates, 5 tab.

Descriptors: *Texas, *Flood data, *Peak discharge, *Land use, Flood flow, Flood forecasting, Cloudbursts, Flood frequency flood peak, Flood plains, Planning, Flood profiles, Historic floods, Flood stages, Standard Project Flood. Identifiers: Atlanta(TX), *Black Bayou(TX), Haw Creek(TX), Intermediate Regional Flood.

The study area includes the portions of the City of Atlanta, Texas that are subject to flooding from Black Bayou, Haw Creek, and two unnamed tributaries. Some residential and commercial developments exist in the flood plains. Several new developments are in the planning or construction phases. Stage and discharge records are not available for the study area, except for some highwater marks. Other flood data were obtained from precipitation records, U.S. Geological Survey maps, newspaper files and historical documents. The main flood season is spring and results from general heavy rains, although flooding may occur at any time of year. The worst flood of record occurred on April 26, 1958. The peak Intermediate Regional Flood flows would be 11,700 cubic feet/second on Black Bayou, 3,820 cubic feet/second at the mouth of Haw Creek tributary, and 990 cfs at the mouth of the Black Bayou tributary. Feak Standard Project Flood flows would be 20,600 dfs on Black Bayou, 5,060 dfs at the mout of Haw Creek, 1,020 dfs at the mouth of the Black Bayou tributary. The data contained in this report were requested for use in the development of suitable land use controls. (Nessa-NC)

FLOOD PLAIN INFORMATION: CHADAKOIN RIVER, JAMESTOWN-FALCONER, NEW YORK.

Army Engineer District, Pittsburgh, Pa.

Prepared for Jamestown, Falconer, Allegheny River Basin Regional Water Resources Board, and Others, October, 1970. 55 p, 14 fig, 13 plates, 14 tab.

Descriptors: *New York, *Historic floods, *Flood data, *Peak discharge, Floods, Flood flow, Flood forecasting, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Planning. Identifiers: *Chadakoin River(NY), Jamestown(NY), Falconer(NY), Ellicot(NY).

The study area includes the portions of the cities of Jamestown, Falconer, and Ellicot that are subject to flooding by the Chadakoin River, involving 9.6 miles of the River. Industrial, commercial, and residential properties occupy the flood plain. Flood data were obtained from stream gage records, newspaper accounts and historical docu-ments. The main flood season in January through April and is caused by rainfall, snowmelt, or both. The only current flood prevention measures consist of the Warner Dam on the Chadakoin River, operated by the City of Jamestown. Eight bridges or buildings create obstructions to flood flow. The greatest floods of record occurred in Jamestown in April 1912 and in Falconer in April 1947. Stream gage records are not available for the 1912 flood. The 1947 flood discharged 2,120 cubic feet per second (cfs) at the Falconer gage. Another more recent flood, occurring in April 1961, discharged 1,720 cfs. The Intermediate Regional Flood would discharge 3,000 cfs and the Standard Project Flood would discharge 4,500 cfs. Three bridges would be overtopped by the Intermediate Regional Flood. The report does not present solutions to flood plain problems, but rather is presented as a basis for future planning for flood plain management. (Nessa-NC)

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTA-RIES, ROCKLIN, CALIFORNIA. Army Engineer District, Sacramento, Calif.

Army Engineer District, Sacramento, Calif. Prepared for the City of Rocklin, Calif., April 1976. 29 p, 14 fig, 24 plates, 8 tab.

Descriptors: *California, *Flood data, *Peak discharge, *Planning, Floodwater, Flood flow, Streamflow forceasting, Flood freecasting, Flood peak, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Land use. Identifiers: Rocklin(CA), Placer County(CA), *Antelope Creek(CA), *Secret Ravine(CA), Intermediate Regional Flood.

The study area includes the portions of Rocklin and adjoining areas in Placer County, California, that are subject to flooding by Antelope Creek, Secret Ravine, and their tributaries. Properties on the flood plain are primarily residential, and anticipated development pressures will consume the remaining open space. There are no streamflow gages in the streams under study. Records from two stream gaging stations on Dry Creek downstream from the study area were used in deriving basic hydrologic data for this study. Precipitation records and U.S. Geological Survey (USGS) topographic maps were used; 145 cross sections were developed from several data sources. The main flood season occurs from October through May and results from heavy general rainfall in the tributary area. Sixteen flood events are known to have occurred on Dry Creek since the mid 1930's. It is reasonable to assume that numerous flood events have occurred on streams in the study area since they are the principal source of Dry Creek. It is predicted that the Intermediate Regional Flood would discharge 3,450 cubic feet per second (cfs) and the Standard Project Flood would discharge 6,400 cfs near the study area's lower limit. (Nessa-NC) W77-11842

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE, UTAH.

Army Engineer District, Sacramento, Calif. Prepared for Cache County, Utah, May 1976, 27 p, 6 tab, 12 fig, 16 plates.

Descriptors: *Floods, *Flood data, *Utah, Maximum probable flood, Flood peak, Historic floods, Flood plains, Flood flow, Peak discharge.

Identifiers: *Blacksmith Fork(Utah), *Spring Creek(Utah), Millville Canyon Creek(Utah), Millville Canyon Creek(Utah), Providence(Utah), Nibley(Utah), Millville(Utah), Cache County(Utah), 100-year flood, 500-year flood.

The study area involves 7 miles of Blacksmith Fork, 3 miles of Spring Creek and I mile of Millville Canyon Creek. Spring Creek and Millville Canyon Creek. Spring Creek and Millville Canyon Creek are both tributary to Blacksmith Fork. The towns of Millville, Nibley, and Providence, and adjoining areas in Cache County, Utah are subject to flooding. Development on the Blacksmith Fork floodplain is primarily agricultural, with only a few scattered dwellings, but many roads. Providence is situated directly across the Spring Creek flood plain. The Millville Canyon Creek flood plain is agricultural. Development pressure exists in all of the areas and could affect the flood plains. Flood data were obtained from a stream gage maintained on Blacksmith Fork since 1913, USGS 7.5 minute quadrangle sheet entitled 'Logan' (1961), newspaper files, and precipitation records. Floods result from general rains, melting snow, or severe cloudbursts, and they occur from mid-April through September. All would be overtopped by 500-year flood, many inundated by the 100-year flood. A cloudburst flood on Spring and Millville Canyon Creeks in August 1959 resulted in a peak flow on Spring Creek in August 1959 resulted in a peak flow on Spring Creek on Blacksmith Fork in May 1971 had a peak flow of 825 cfs. The 500-year flood is expected to discharge 4,700 cfs on Blacksmith Fork at the State Highway 242 bridge gage, and 2,200 cfs on Spring Creek. The root of 100 dould discharge 2,300 cfs at the gage, and 600 cfs on Spring Creek. There are no flood control facilities for the study area which have been authorized, and none are under investigation. (Nessa-NC)

FLOOD PLAIN INFORMATION: ANDROSCOG-GIN AND DEAD RIVERS, LEEDS, MAINE. Army Engineer District, Waltham, Mass. New Enoland Div.

Prepared for Leeds, Maine, December 1975. 28 p, 22 fig, 14 plates, 5 tab.

Descriptors: "Maine, "Flood data, "Peak discharge, "Land use, Planning, Flood flow, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Flood peak, Flood plains, Standard Project Flood.

Identifiers: *Androscoggin River(ME), *Dead River(ME), Leeds(ME), Androscoggin Lake(ME), Intermediate Regional Flood.

The study area includes the portions of Leeds, Maine that are subject to flooding by the Androscoggin and Dead Rivers, and Androscoggin Lake. Some residential and commercial developments exist on the flood plains. There are no stream gaging stations in the study area but there are gages both upstream and downstream from the study area. These gage records were used to estimate flood flows in Leeds. Other flood data were obtained from newspaper files and historical documents. The main flood season occurs in the spring and results from a combination of snowmelt and heavy rains. The worst flood of record occurred on March 20, 1936 and discharged 118,550 cubic feet/second (cfs) at the Leeds downstream town line. At the same location, the Intermediate Regional Flood (IRF) would discharge 107,000 cfs, and the Standard Project Flood (SPF) would

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Group 4A-Control Of Water On The Surface

discharge 154,000 cfs. Four bridges in the study area would be overtopped by the IRF. The data contained in this report are intended for use in the development of suitable land use controls and an overall flood plain management program. (Nessa-

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA. Army Engineer District, Waltham, Mass. New En-

Prepared for Lawrence, Methuen, Andover, and North Andover, MA., March 1972. 109 p, 25 fig, 17

Descriptors: *Massachusetts, *Flood data, *Peak discharge, *Land use, Flood flow, Flood forecast-ing, Flood profiles, Historic floods, Flood frequency, Flood peak, Flood plains, Non-structural alternatives, Flood plain zoning, Building codes, Standard Project Flood.
Identifiers: *Merrimack River(MA), *Shawsheen

River(MA), *Spicket River(MA), Lawrence(MA), Methuen(MA), Andover(MA), North Andover(MA), Intermediate Regional Flood.

The study area includes the portions of the cities of Andover, Lawrence, Methuen, and North Andover that are subject to flooding by the Mer-rimack, Shawsheen, and Spicket Rivers. Most development in the four cities has taken pla side of the flood plain. Flood data were obtained from stream gage records, newspaper files, and historical documents. The main flood season is spring and is caused by rain, snowmelt, or both. The greatest flood of record on all 3 rivers occurred in March, 1936. Stream gage records are not available for this date. Compared with the 1936 flood, the Intermediate Regional Flood would be about 10 feet lower on the Merrimack River, 4 feet higher on the Shawsheen River, and identical on the Spicket River, while the Standard Project Flood would be 3 feet lower on the Merrimack, 1-3 feet lower on the Shawsheen, and 2 feet higher on the Spicket. Although intended for informational purposes, this report describes non-structural control measures, including zoning, subdivision con-trol, and flood plain regulations. (Nessa-NC)

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE,

Army Engineer District, Waltham, Mass. New En-

Prepared for Old Town, Maine, and Maine Soil and Water Conservation Commission, December 1975. 36 p, 29 fig, 18 plates, 5 tab.

Descriptors: *Maine, *Flood data, *Peak discharge, *Planning, Floods, Flood flow, Flood forecasting, Historic floods, Flood frequency, Flood peak, Flood plains, Standard Project Flood, Land use.

Identifiers: *Penobscot River(ME), *Stillwater River(ME), Old Town(ME), Milford(ME), Bradley(ME).

The study area includes the portions of the City of Old Town and the Towns of Bradley and Milford that are subject to flooding by the Penobscot and Stillwater Rivers. Extensive development exists on both flood plains, and further development is imminent. Flood data were obtained from stream gages, newspaper files, historical records, and U.S. Geological Survey (USGS) topographic maps. The main flood season occurs in the spring when snowmelt in conjunction with heavy rains raises water levels. Less severe floods are caused by tropical storms and hurricanes in the fall. The greatest recorded flood flows occurred on both rivers on May 1, 1923, discharging 150,000 cubic feet per second (cfs) on the Penobscot

downstream from Sunkhaze Stream, and 47,000 cfs on the Stillwater at Gilman Falls. A more recent flood, on April 30, 1973, discharged 93,100 cfs and 28,900 cfs on the Penobscot and Stillwater Rivers, respectively. At the same locations, the Intermediate Regional Flood flow on the Penobscot will be 164,000 cfs, and 50,000 cfs on the Stillwater. The Standard Project Flood will be 180,000 cfs on the Penobscot, and 55,000 on the Stillwater. The data contained in this report are intended for use in the development of suitable land use con-trols and an overall flood plain management program. (Nessa-NC) W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.

Army Engineer District, Waltham, Mass. New Enoland Div Prepared for Town of Fryeburg, ME, August 1971.

48 p, 12 fig, 13 plates, 6 tab.

*Maine, *Flood data, Descriptors: discharge, *Land use, Flooding, Flood flow, In-direct flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Flood peak, Flood plains, Standard Project Flood, Planning.

Identifiers: Fryeburg(ME), *Saco River(ME), In-

termediate Regional Flood

The study area includes the portions of the town of Fryeburg, ME. that are subject to flooding from the Saco River. Some residential and commercial developments exist on the flood plain. There are no stream gaging stations in the study area, but there is a U.S. Geological Survey (USGS) gage above the study area in Conway, New Hampshire, and below the study area in Cornish, Maine. Other flood data were obtained from newspaper files and historical documents. The main flood season is the spring and results from heavy general rains and snowmelt. Hurricanes and tropical storms may cause floods in the fall. The worst flood of record occurred in March, 1936, discharging 29,300 cubic feet/second (cfs) at the Cornish gage. Most of the resulting damage in Fryeburg was concentrated at Lovewell Pond whose waters rose 24 feet above normal. Another large flood occurred in March, 1953, discharging 28,300 cfs. The Intermediate Regional flood should crest at the same height as the March 1936 flood. The Standard Project Flood should crest about 2 feet higher than the March 1936 flood. Eight of the bridges crossing the river would be overtopped by the Intermediate Regional Flood. The data contained in this report are insince use contained in this report are in-tended for use in the development of suitable land use controls and an overall flood plain manage-ment program. (Nessa-NC) W77-11847

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS.

Development and Resources Corp., Sacramento, Calif. For primary bibliographic entry see Field 6F.

W77-11850

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DIS-

TRICT, Florida Univ., Gainesville. Dept. of Environmen-For primary bibliographic entry see Field 6B. W77-11859

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINAN-CIAL METHODS FOR IMPLEMENTING PUR-POSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II, Institute for Public Administration, New York For primary bibliographic entry see Field 6F.

W77-11860

GUIDELINES FOR FLOOD DAMAGE REDUC-

Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 6F. W77-11862

REGIONAL WATER MANAGEMENT WITH

FULL CONSUMPTIVE USE, New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Busi-

For primary bibliographic entry see Field 6B. W77-11866

THE HYDROLOGIC HISTORY OF THE SAN CARLOS RESERVOIR, ARIZONA, 1929-71, WITH PARTICULAR REFERENCE TO EVAPOTRANSPIRATION AND SEDIMENTA-TION, Geological

Survey, Tucson, Ariz. Water Resources Div. For primary bibliographic entry see Field 2D.

W77-11870

FLOOD-PRONE AREAS AND LAND-USE PLANNING-SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION,

Geological Survey, Menlo Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif.

A. O. Waananen, J. T. Limerinos, W. J. Kockelman, W. E. Spangle, and M. L. Blair. For sale by Supt. of Documents, GPO, Washington, DC 20402, price \$2.20. Professional Paper 942, 1977. 75 p, 28 fig. 10 tab, 98 ref.

Descriptors: *Flood plains, *Flood protection, *Land use, *Planning, *Management, *California, Costs, Flood control, Hydrologic data, Reviews, Streamflow, Flood profiles, Flood peak, Maps, Flood frequency, Flood plain insurance, Regulation, Evaluation. Identifiers: *San Francisco Bay area(Calif).

The common goal of flood-plain regulation and use is protecting life, minimizing public expenditures, and reducing flood loss. A comprehensive program combining structural and nonstructural measures can yield substantial benefits and may present a practical approach for managing a flood plain. A review of flood-plain planning, manage-ment, and regulation in the San Francisco Bay region, Calif., as shown by a study of Napa County, demonstrates complex multijurisdictional involve-ments. (Woodard-USGS) W77-11871

AUTOMATIC CATEGORIZATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MUL-TISPECTRAL SCANNER (S-192) DATA, Geological Survey, Tampa, Fla.; Geological Sur-vey, Miami, Fla. Water Resources Div.; and

dix Aerospace Systems Div., Ann Arbor, Mich.

For primary bibliographic entry see Field 7B. W77-11875

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975-VOLUME 2. SOUTHERN

FLORIDA. Geological Survey, Tallahassee, Fla. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11876

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.

Geological Survey, Tallahassee, Fla. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11877

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11880

HYDROLOGIC UNIT MAP-1974, STATE OF ARKANSAS.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11881

HYDROLOGIC UNIT MAP-1974, STATE OF KENTUCKY.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C.

W77-11882

HYDROLOGIC UNIT MAP-1974, STATE OF

MISSISSIPPI. Geological Survey, Reston, Va. Water Resources

Div.
For primary bibliographic entry see Field 7C.
W77-11883

HYDROLOGIC UNIT MAP-1974, STATE OF TENNESSEE.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11884

HYDROLOGIC UNIT MAP--1974, STATE OF MISSOURI.

Geological Survey, Reston, Va. Water Resources Div. For primary bibliographic entry see Field 7C.

W77-11885

FUTURE PROBLEMS AND WATER RESOURCES RESEARCH NEEDS OF THE IL-LINOIS RIVER SYSTEM.

Illinois Univ. at Urbana-Champaign. Water Resources Center. For primary bibliographic entry see Field 6B. W77-11937

SELECTING AND PLANNING HIGH COUNTRY
RESERVOIRS FOR RECREATION WITHIN A
MULTIPURPOSE
MANAGEMENT
FRAMEWORK

MULTIPURPOSE MANAGEMENT FRAMEWORK, Colorado State Univ. Fort Collins. Dept. of Recreation Resources.

For primary bibliographic entry see Field 6B.
W77-11938

MORPHOLOGY AND MORPHOMETRY OF A CHANNELIZED STREAM: THE CASE HISTORY OF BIG PINE CREEK DITCH, BENTON, COUNTY, INDIANA, STUDIES IN FLUVIAL GEOMORPHOLOGY NO. 4,

Purdue Univ., Lafayette, Ind. Dept. of Geosciences.

For primary bibliographic entry see Field 2E. W77-11939

RAINFALL PARAMETERS TO PREDICT SUR-FACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES, Rhodesia Dept. of Conservation and Extension, Salisbury.

For primary bibliographic entry see Field 2B. W77-11964

ESTIMATION OF PARAMETERS OF A UNIFORMLY NONLINEAR SURFACE RUNOFF MODEL.

New Mexico Inst. of Mining and Technology, Socorro.

THE CENTRAL ARIZONA PROJECT: 1918-

For primary bibliographic entry see Field 2E. W77-11985

Central Arizona Project Association, Phoenix. For primary bibliographic entry see Field 6B. W77-11999

DIGITAL SIMULATION OF A DRAINAGE BASIN.

Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources. For primary bibliographic entry see Field 2A. W77-12082.

LINEAR AND NONLINEAR MODELS FOR PEAK FLOW FORECASTING,
Vied Bratislava

Slovenska Akademie Vied, Bratislava (Czechoslovakia). A. Svoboda.

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 455-460, 1974. 3 fig, 1 tab.

Descriptors: *Peak discharge, *Reservoirs, *Flow system, *Model studies, Mathematical models, Flow, Inflow, Discharge(Water), Reservoir storage, Surface waters, Hydrology. Identifiers: Linear models, Nonlinear models.

The paper dealt with the influence of the non-linearity of a hydrologic system on the ouput peak. A system consisting of a series of equal reservoirs was used. The calculations were performed for uniform input of various magnitude (P sub k), various duration (T), and for systems with various degrees of nonlinearity (b). The results for the system consisting of a single reservoir (N = 1) were presented. For each duration T, it was possible to find an input magnitude which results in the same output (qk) peak for any degree of nonlinearity b. The value of so called critical input (P sub kr) depends on its duration. Results were presented for a number of reservoirs in series N = 1,2,3 and 5. The results of analytical solution for limiting cases (b approaching 0 and b approaching infinity) for a single reservoir were also presented. (See also W77-06708) (Sims-ISWS) W77-12083

A SWAMPLAND MODEL,

Ministerio do Interior, Rio de Janeiro (Brazil). Departmento Nacional de Obras de Saneamento. For primary bibliographic entry see Field 2E. W77-12085

A DETERMINATE MODEL FOR RUNOFF AS A NONLINEAR SYSTEM, Gatehouse Farm, Essex (England).

Gatehouse Farm, Essex (England). For primary bibliographic entry see Field 2E. W77-12099

MATHEMATICAL MODEL OF SPRING RUNOFF FORMATION,

Hydrometeorological Service of the USSR,

For primary bibliographic entry see Field 2A. W77-12101

MATHEMATICAL MODELLING OF THE FOR-MATION OF RIVER RUNOFF IN MOUNTAIN DRAINAGE BASINS,

Sredneaziatskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Tashkent (USSR).

For primary bibliographic entry see Field 2A. W77-12103

SIMULATING OVERLAND FLOW ON HILL-SLOPES WITH A KINEMATIC CASCADE, Agricultural Research Service, Beltsville, Md. Hydrography Lab. For primary bibliographic entry see Field 2A. W77-12108

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.

Geological Survey, Austin, Tex. Water Resources Div.

Texas District report, February 1977. 25 p, 1 plate.

Descriptors: *Water resources, *Data collections, *Texas, *Projects, *Bibliographies, Surface waters, Water quality, Groundwater, Streamflow, Flow characteristics, Gaging stations, Lakes, Reservoirs, Water quality, Sediment transport, Water resources development.

This report describes the water-resources projects and activities of the U.S. Geological Survey in Texas for the 1977 fiscal year (October 1, 1976 to September 30, 1977). A continuing series of measurements and analyses are made of streamflow, reservoir contents, and estuarine flow. In addition, data collected on the chemical quality of water, sediment in streams and reservoirs, water levels in wells, and land-surface subsidence. As of September 30, 1976, the following data-collection streins were in operation: 553 continuous streamgaging, reservoir-content, and stage-only stations. Partial-record streamflow sites included 84 low-flow, 13 crest-stage, 68 flood-hydrograph, 12 flood-profile, and 57 tide-level stations, and 18 reconnaissance stations. Water-quality sites included 30 continuous stations, 121 daily stations, 4 suspended-sediment stations, 154 periodic stations, and 70 stations on reservoirs. Included is a list of 70 reports in preparation, released, or published during the year. (Woodard-USGS) W77-12151

DESIGN OF SURFACE WATER DATA NET-WORKS FOR REGIONAL INFORMATION, Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7A. W77-12154

MAXIMUM FLOODFLOWS IN THE CONTER-MINOUS UNITED STATES, Geological Survey, Menlo Park, Calif. Water

Resources Div.
For primary bibliographic entry see Field 7C.
W77-12156

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH, Geological Survey, Salt Lake City, Utah. Water

Resources Div.
For primary bibliographic entry see Field 4B.
W77-12158

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies. For primary bibliographic entry see Field 5G.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

W77-12159

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN, Metropolitan Sanitary District of Greater Chicago,

F. L. Kudrna.

Water Resources Bulletin, Vol. 13, No. 4, p 825-833, August 1977. 3 fig.

Descriptors: *Flood control, *Project planning, *Programs, *Watersheds(Basins), *River basins, *Water managements, *Water planning, *Water planning, *Water planning, *Water resources, Legislation, Streams, Drainage, Erosion, Land use, Regional development Sewers Ulinois

development, Sewers, Illinois.

Identifiers: *Public participation, Chicago(III),
Urban planning, Urban development, Little Calu-

met River(Ill).

The Chicago Metropolitan Floodwater Management Plan is a cooperative planning program und Public Law 566 of the 83rd Congress (The Watershed Protection and Flood Prevention Act). The planning effort was jointly sponsored by the U.S. Department of Agriculture, Soil Conservation Service, and the Metropolitan Sanitary District of Greater Chicago. The project is unique in that it studies a 1260 square mile (3266 sq. kilome-ter) watershed, which is approximately 35 percent urbanized and contains approximately 7.5 million people. At present, approximately 4.4 percent or 330,600 people live in a floodplain. It is presently estimated that 80,000 acres (32,000 ha.) of the study area are subject to flooding with a current average annual damage estimated at approximately \$10 million. The Plan which has been developed to reduce or eliminate these damages is divided into six separate watershed plans, and has been developed through extensive use of local citizen watershed steering committees. The paper discusses the planning process, public participation and implementation both at an overall river basin level and watershed case study level; considered are the Chicago Metropolitan Area River Basin study area and the Littel Calumet Watershed Floodwater Management Plan. (Bell-Cornell) W77-12162

A NEW APPROACH FOR ESTIMATING IR-RIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION,

Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados. For primary bibliographic entry see Field 3F. W77-12164

SIMULTANEOUS INVESTMENT AND ALLO-CATION DECISIONS APPLIED TO WATER

Texas Univ. at Austin. For primary bibliographic entry see Field 6A. W77-12168

A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSI-

TY, Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering. A. Y. Hachum, and J. F. Alfaro

Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 16 p. 1 fig. 2 tab. 15

Descriptors: Infiltration, Rainfall, Model studies, *Simulation analysis, Rain, *Rainfall intensity, *Rainfall simulators, Rainfall-runoff relationships, *Runoff, *Forecasting.

A review of literature revealed that there are many empirical and physically-based models that have been proposed to analyze infiltration under dif-

ferent rainfall conditions. However, the validity of these models is still unknown due to the lack of experimental data to support them. A simple and universal physical model capable of predicting the ponding time and the rain infiltration in soils is presented. Basically, the model is an extension of the Green and Ampt approach to analyze infiltra-tion under variable rainfall patterns. Model applications for a storm presented elsewhere (Smith 1972) is included as well as for a hypothetical storm with a smooth-variable intensity rainfall pat-tern. The prediction of the system behavior, for the first case, closely agrees with that of Smith (1972). (Skogerboe-Colorado State)

4B. Groundwater Management

AXIAL-FLOW PUMPS FOR DEEP WATERS. Mono Pumps Africa Pty Ltd. (South Africa). For primary bibliographic entry see Field 8C. W77-11550

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,

Research Council of Alberta, Edmonton For primary bibliographic entry see Field 2F. W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPITI AREA, ALBERTA, Research Council of Alberta, Edmonton

For primary bibliographic entry see Field 2F. W77-11588

HYDROGEOLOGY OF THE WHITECOURT AREA, ALBERTA,

Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F. W77-11589

METHOD OF CALCULATING THE DRAULIC PROPERTIES OF LEAKY HYDRAULIC AQUIFER SYSTEMS, VIAK A. B., Falun (Sweden).

For primary bibliographic entry see Field 2F. W77-11605

FLUCTUATIONS IN THE WATERLEVEL IN WELLS DUE TO VARIATIONS IN AT-

MOSPHERIC PRESSURE, TERRAQUA ApS, Kalundborg (Denmark). T. Sorensen, and H. Kaergaard. Nordic Hydrology, Vol. 8, No. 2, p 83-92, 1977. 5 fig, 10 ref.

Descriptors: *Europe, *Wells, *Atmospheric pressure, Well data, Barometric efficiency, Artesian aquifers, Groundwater, Groundwater basins, Hydrology, Equations, Mathematical studies, Aquifer testing. Identifiers: *Aquifer skeleton, *Denmark.

Deviations from the classical theory of the bevanuels from the classical theory of the barometric efficiency were shown in some examples. A model with a semipermeable bed overlying the aquifer was proposed, and equations were presented for the flow in the model. Solutions were given for specified variations in the total load, and some data from nature were compared with one of the solutions. The data presented were from the archives of the Geological Survey of Denmark, Hydrogeological Department. (Lees-ISWS) W77-11606

ESTIMATION OF TRANSMISSIVITY AND PERMEABILITY IN SWEDISH BEDROCK, Univ. of Technology, For primary bibliographic entry see Field 2F.

W77-11607

CYANIDE MOBILITY IN SOILS,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering. For primary bibliographic entry see Field 5B. W77-11619

RESTRICTED DRAINAGE AND ITS EFFECT ON RISING GROUND WATER TABLE AND SOIL SALINITY,

Ministry of Agriculture, Cairo (Egypt). Soils and Water Research Inst.

R. M. Abdel-Aal, A. A. Abdel-Wahed, and M. S.

Agricultural Research Review (Cairo), Vol 54, No 4, p 163-176, April, 1976. 7 fig, 6 tab, 7 ref.

Descriptors: *Drainage, *Drainage effects, *Surface-groundwater relationships, *Salinity, *Saline water, Groundwater, Saline soils, Water table, Soil profiles, Irrigation, Salts, Cations, Sodium, Calcium, Magnesium, Chlorides, Anions, Saline water intrusion, Water level fluctuations, Water quality, Alluvium. Identifiers: Egypt.

It has previously been established that the rise of the groundwater table is the main factor responsible for deterioration through salinization of the Egyptian alluvial soils. The salt contents of the groundwater are increasing with time, especially where impeded drainage dominates. A saline area along the Ismailia Canal near Cairo was selected to study the effect of high saline groundwater on soil profile. The study includes ten profiles to the depth of the fluctuating groundwater table. Six samples from each profile were collected. The results are presented and show that the area suffers from high water table and high salinity. It was found that there is a correlation between the salt content of the groundwater and that in the soil crust. In addition, it was shown that the salt content of the groundwater and that in the surface crust was greatly higher than the salt content of the top layer up to 45 centimeters from the surface. (Jamail-Arizona) W77-11627

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.

Arizona Univ., Tucson. Office of Arid Lands Studies. For primary bibliographic entry see Field 6B. W77-11637

RENOVATION OF MUNICIPAL WASTE-WATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 5G. W77-11692

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARIPIE CORPS AIR STATION KLIPPER GOLF COURSE, Hawaii Univ., Honolulu. Water Resources Research Center

For primary bibliographic entry see Field 5D. W77-11792

HOT GROUNDWATER SYSTEMS IN ICELAND TRACED BY DEUTERIUM, Iceland Univ., Reykjavik. Science Inst. For primary bibliographic entry see Field 2F. W77-11812

COMPREHENSIVE GEOHYDROLOGICAL STUDY OF CONSOLIDATED SEDIMENTARY ROCKS IN BORNHOLM, TERRAQUA Aps, Kalundborg (Denmark). For primary bibliographic entry see Field 2F.

For primary W77-11813

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POL-LUTION CONTROL ACT AMENDMENTS, For primary bibliographic entry see Field 5G. For primar W77-11863

RELATIONSHIP OF TECTONIC STRUCTURE TO AQUIFER MECHANICS IN THE WESTERN Wyoming Univ., Laramie. Dept. of Geology. For primary bibliographic entry see Field 2F. W77-11867

MOVEMENT OF MOISTURE IN THE UNSATU-RATED ZONE IN A LOESS-MANTLED AREA, SOUTHWESTERN KANSAS,

Geological Survey, Mineola, N.Y. Resources Div.

R C Prill

W77-11872

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For sale by Supt. of Documents, GPO, Washington, DC 20402, price \$1.70. Professional Paper 1021, 1977. 21 p, 20 fig, 4 tab, 11 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Ponding, *Water spreading, *Loess, Soil moisture, Soil water movement, Flow rates, Deep percolation, Induced infiltration, Evalua-tion, *Kansas. Identifiers: Southwestern Kansas, High Plains.

A study of moisture movement associated with ponding near Garden City, Kansas, indicates that loess-manted areas have excellent potential for ar-tificial recharge by water spreading. Infiltration stabilized at rates ranging from 0.7 to 2.2 feet (0.2 to 0.7 meter) per day reflecting changes in hydrau-lic conductivity of soil horizons. Results of the study indicate that the underlying loess has the capacity to temporarily store about 1 cubic foot (0.03 cubic meter) of water for each 6 cubic feet (0.17 cubic meter) of material. Owing to relatively high hydraulic conductivities of the loess and alluvium, however, moisture continues to move through the unsaturated zone. After application of 21 feet (6 meters) of water, mounding at the water table had a maximum thickness of 2 feet (0.6 meter) at the edge of the pond. Although the boundary of mounding spread rapidly, the applied water moved slowly by lateral displacement. (Woodard-USGS)

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT BASIN REGION,

Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water

T. E. Eakin, D. Price, and J. R. Harrill. For sale by Supt. of Documents, GPO, Washington, DC 20402. Professional Paper 813-G, 1976. 37 p, 8 fig, 1 plate, 8 tab, 17 ref.

*Groundwater Descriptors: "Groundwater resources, "Appraisals, "Great Basin, "Nevada, "Utah, Wyoming, Idaho, Groundwater basins, Water supply, Water yield, Groundwater availability, Water quality, Groundwater potential, Water resources development, Withdrawal, Pumping.

Ground-water withdrawals by wells in the Great Basin Region were about 1.1 million acre-feet in 1970. An appraisal of the regional ground-water resource indicates the region could sustain an annual net pumpage of about 2.6 million acre-feet. Larger withdrawals could be sustained if only part of the pumped water was used consumptively, if conflicts with existing surface-water rights are resolved, and if extensive treatment, artificial recharge, and reuse of water prove feasible. Ground water stored in the upper 100 feet of saturated deposits of the valley ground-water reservoirs is estimated to be on the order of 300 million acre-feet. Total ground-water storage probably exceeds several billion acre-feet. Only a few areas of the Great Basin Region have been studied in detail sufficient to enable adequate design of an area-wide ground-water development. These areas alhave been developed. As of 1973 data for broadly outlining the ground-water resources of the region had been obtained. However, if largescale planned development is to become a reality. a program for obtaining adequate hydrologic and related data would be a prerequisite. Ideally, the data sould be obtained in time to be available for the successively more intensive levels of planning required to implement developments. (Woodard-USGS)

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975-VOLUME 2. SOUTHERN FLORIDA.

Geological Survey, Tallahassee, Fla. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975-VOLUME 1, NORTHERN FLORIDA

Geological Survey, Tallahassee, Fla. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11877

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, NORTH FLORIDA, MAY 1976,

Suwannee River Water Management District, Fla.; and Geological Survey, Tallahassee, Fla. Water Resources Div.

For primary bibliographic entry see Field 7C. W77-11878

DIGITAL MODEL ANALYSIS OF THE PRIN-CIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA,

Geological Survey, Doraville, Ga. Water Resources Div. For primary bibliographic entry see Field 7C. W77-11879

GROUND WATER RECHARGE IN WESTERN UTTAR PRADESH,

Indian Inst. of Tech., Kanpur. Dept. of Chemistry. P. S. Datta, P. S. Goel, and S. P. Sangal. Proc Indian Acad Sci Sect A. 78(1), p 1-12, 1973.

*Groundwater Descriptors: recharge. *Groundwater movement, *Soil water movement, *Irrigation, Precipitation(Atmospheric), moisture, Tritiated water. Identifiers: *India(Western Uttar Pradesh).

The downward movement of water in the soil due to 1971 monsoon precipitation and supplemental surface irrigation was traced at about 45 sites in Western Uttar Pradesh (India), using a thin layer of moisture tagged with tritiated water. The tritiated layer moved down to different depths at different sites. The movement, averaged over the 40 sites was 96 cm, indicating that the average recharge for the year 1971 (a year of normal mon-soon) was 21.5 cm of water. Copyright 1974, Biological Abstracts, Inc. W77-11932 INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS, New Zealand Agricultural Engineering Inst., Lin-

For primary bibliographic entry see Field 5B.

WATER AND DEVELOPMENT IN SAUDI ARABIA

Durham Univ. (England). Dept. of Geography.

P. Beaumont. The Geographical Journal, Vol 143, Part 1, March 1977, p 41-60. 3 tab, 6 fig, 18 ref.

Descriptors: *Water resources development, *Groundwater, *Water resources, *Competing uses, Water allocation(Policy), Aquifers, Desalination, Desalination plants, Arid lands, Arid Desalnation, Desalnation plants, Arid lands, Arid climates, Projects, Project planning, Dams, Water quality, Water conservation, Water demand, Water management(Applied), Water policy, Domestic water, Industrial water, Irrigation programs, Planning, Irrigation water, Sewage effluents, Sewage treatment, Water pollution, Water storage, Environmental effects, Desalination wastes, Urbanization, Agriculture, Foreign countries

Identifiers: *Saudi Arabia(Al Hasa Project).

Rapid economic development in Saudi Arabia has increased demands upon scarce water resources. The paucity of rainfall and the absence of reliable surface water reserves has concentrated attention upon the large groundwater reserves of eleven major aquifers. Groundwater has been developed chiefly for irrigation. But because little recharge is taking place, a number of dams have been constructed to facilitate artificial recharge of aquifers. In addition to the shortage of water Saudi Arabia is also short of land suitable for development of agricultural production. A number of development projects to facilitate irrigation have been un-dertaken by the government. However, large-scale projects for developing water resources for agricultural needs have thus far not been as successful as was hoped, and smaller-scale projects have been encouraged. Rapid urbanization and per capita increases in water demand have further strained the country's water resources. Solutions have been sought with wells tapping deep aquifers and by desalination methods. Potentially the greatest threats to further developments include water quality deterioration from salt-water intruvacet quality deterioration from saltwater indu-sion resulting from pumping, salimity build-up in ir-rigated soil, sea water oil pollution, and con-tamination from urban sewage effluents. (Ullery-W77-11991

CONSERVATION IN KANO.

J. Samways. Geographical Magazine (England), Vol 49, No 8, p 504-507, May, 1977.

Descriptors: *Water resources development, *Water management(Applied), *Water supply development, *Water storage, *Water utilization, *Africa, Water requirements, Storage, Wells, Groundwater, Dams, Semiarid climates, Water demand, Boreholes, Drill holes, Drilling, Water conservation, Water supply, Water resources, Social aspects, Social impact.
Identifiers: *Nigeria, Developing countries.

Kano state, in the north of Nigeria, has a water problem arising from a decreased supply and in-creased demand. The problems of supplying water to this region are discussed and the technical problems of water delivery outlined. Water for the area can be drawn from underground wells and from surface storage resulting from dam construction. The problem of water storage is discussed and socio-economic problems created by the building of dams are presented. Inundation calls for resettlement which can result in much stress and the loss of individual and community rights.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

The tapping of groundwater supplies through the use of boreholes is evaluated. In some areas of the state the groundwater is largely sub-artesian and diesel pumps have to be installed to lift the water to the surface. The expense and difficulty of mainto the surface. The expense and unrouty of main-taining drilling rigs and providing equipment in remote areas where communication is poor is discussed. (Jamail-Arizona) W77-11993

EFFECT OF DEPTH AND QUALITY OF GROUND WATER ON SOIL SALINIZATION: A FIELD STUDY WITH A FLUCTUATING WATER TABLE,

Central Soil Salinity Research Inst., Karnal (India). For primary bibliographic entry see Field 2G. W77-12000

A DISCRIMINANT FUNCTION FOR GROUND WATER EXPLORATION,
Southern Methodist Univ., Dallas, Tex.

Geophysics Div. For primary bibliographic entry see Field 2F. W77-12003

MODELLING GROUNDWATER RESOURCES REPLENISHMENT DUE TO RIVER FLOW IN THE FLOOD PERIOD DURING THE TION OF INFILTRATION WATER INTAKE, THE FLOOD PERIOD DURING THE OPERA-All-Union Scientific Research Inst. Hydrogeology and Engineering Geology, Moscow (USSR).

For primary bibliographic entry see Field 2F. W77-12110

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.

Geological Survey, Austin, Tex. Water Resources Div.

For primary bibliographic entry see Field 4A. W77-12151

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH,

Geological Survey, Salt Lake City, Utah. Water Resources Div.

Utah Department of Natural Resources, Salt Lake City, Technical Publication No 57, 1977. 34 p, 5 fig, 2 plates, 3 tab, 12 ref.

Descriptors: Water resources, *Surface-ground-water relationships, *Water quality, *Water utilization, *Water yield, Streamflow, Aquifers, Hydrogeology, Pumping, Water wells, Water level fluctuations, Groundwater recharge, Evaluation, Available water.
Identifiers: *Upper Duchesne River Valley(Utah).

The upper Duchesne River valley was studied during 1971-74 as part of an investigation of the northern Uinta Basin area, Utah and Colorado. This report describes the relation of ground water to surface water in the upper Duchesne River valley, estimates the quantity of ground water that moves to the Duchesne River, and evaluates the probable effect of increased ground-water withdrawals on the stream regimen. The primary source of water is precipitation on the highlands adjacent to and north of the area and on the valley itself. Discharge is mainly by flow in the Duchesne River. Adjacent to and within the valley, ground water and surface water are intimately related, and they can interchange in several ways due to both natural and manmade conditions. The valley fill, which is composed mainly of outwash and related glacial debris constitutes the mainground-water reservoir in the valley. The ground water in the fill is unconfined. The volume of ground water stored in the fill, and theoretically available by gravity drainage, is a minimum of 40,000 acre-feet; this

volume fluctuates by a maximum of 10 percent annually. The discharge from wells and springs used for domestic, stock, public, and irrigation pur-poses in 1974 was about 2 cubic feet per second. Most ground water, except in parts of the Uinta Formation, and all the surface water sampled in the study area, was fresh. (Woodard-USGS)

SENSITIVITY ANALYSIS IN AQUIFER STU-

DIES, Stanford Univ., Calif. School of Earth Sciences. E. Aguado, N. Sitar, and I. Remson. Water Resources Research, Vol. 13, No. 4, p 733-737, August 1977. 4 fig, 1 tab, 8 ref.

Descriptors: *Aquifers, *Management, *Planning, *Linear programming, *Groundwater, Optimiza-tion, Wells, Discharge(Water), Dewatering, Pump-ing, Hydraulic conductivity, Equations, Con-straints, Mathematical models, Systems analysis. Identifiers: *Sensitivity analysis.

A method is presented for determining in which areas detailed knowledge of aquifer characteristics and conditions is most critical to the success of a management plan. These questions are answered by using sensitivity analysis to determine how variations in parameters and input data affect the optimal solution of a linear programming manage-ment model. The model uses either finite element or finite difference approximations of the groundwater equations as constraints. The optimal loca-tions and discharge rates of wells have been detertions and discharge rates of wells have been deter-mined for dewatering a rectangular area to a specified level while minimizing steady state total pumping rate and maintaining hydraulic heads in the dewatered area at or below the specified value. The area is in a small aquifer having constant head boundaries. Sensitivity analysis has shown that the optimal steady state solution is most sensitive to hydraulic conductivity at and near the aquifer boundaries parallel to the length of the dewatered area. Thus field exploration and testing should be concentrated on determination of hydraulic contents the state of ductivity in those areas. (Bell-Cornell) W77-12160

SUBSURFACE DRAINAGE COST AND HYDROLOGIC MODEL,

Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering. A. K. Bhattacharya, N. Foroud, S-T. Chieng, and

R. S. Broughton.

Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. IR3, p 299-308, September 1977. 4 fig, 4 tab, 7 ref.

Descriptors: *Drainage practices, *Tiles, *Water balance, *Economics, Hydrology, Water table, Weather data, Simulation analysis, Computers, Costs, Soil water, Effects, Frequency analysis, Mathematical models, Systems analysis. Identifiers: *Economic analysis, *Hydrologic models. Net financial benefit.

A computer simulation water balance model was used to analyze the variation of daily water-table depths in the field using 27 years of weather data and soil water parameters. The high water table in the study area resulted from a cool moist climate and poor natural drainage condition. The effects of drainage rates and drain depths on the water table. were studied. A frequency analysis was made to obtain the recurrence intervals of specific watertable depths for various successive numbers of days. The net financial benefit from the system was evaluated corresponding to various chances of crop failure due to inadequacy of the drainage system during its assumed amortization period. In conclusion, in the absence of definite functional relationships between the processes of a soilreationships between the processes of a some water-plant system, a computer simulation ap-proach becomes valuable in predicting water table depths and their relationships to other pertinent parameters. (Bell-Cornell) W77-12166

4C. Effects On Water Of Man's Non-Water Activities

WATER YIELD CHANGES AFTER THE URBANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND, University Coll., London (England). Dept. of

Hydrological Sciences Bulletin, Vol. 22, No. 1, p 61-75, March 1977. 7 fig, 1 tab, 17 ref.

Descriptors: *Water yield, *Urbanization, *Clay minerals, Watersheds(Basins), Sewers, Surface water, Rainfall-runoff relationships, Flow rates, Rainfall, Runoff, Foreign countries, Foreign

Identifiers: *Water yield changes, *Clay catchment, *Canon's brook catchment(Harlow England), *England, Surface water sewers.

The 21.4 sq km clay catchment of the Canon's Brook was built over during the period 1953-1968. By 1968, 16.6% of the area was paved, and the impervious surfaces drained to the river by means of surface water sewers. Records of rainfall and runoff were taken since 1950, i.e., before development began, and quantitive description be double mass analysis revealed an increased water yield from the catchment as urbanization progre The median flow from 1950 to 1953 was around 0.057 m/s, and the flow had been increased by urbanization to about 0.142 cu m/s in 1968. precise extent of increased water yield and its reflection in the flow regimen were derived from a computer simulation model. The data were calibrated on the records for 1950-1953, and then the flow from an unchanged rural catchment was the How from an unchanged rural catchment was simulated for the period of urban development. 1953-1968. The difference between the gaged urban water yield from a 15% paved catchment and its simulated rural equivalent averaged 59.4 mm per annum, or about 30% of the runoff from the rural catchment. (Roberts-ISWS)

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST, Forest Service (USDA), Grand Rapids, Minn.

Northern Conifers Lab. M. D. Knighton.

Soil Science Society of America Journal, Vol. 41, No. 3, p 627-632, May-June 1977. 3 fig, 4 tab, 28

Descriptors: *Forest fires, *Runoff, *Nutrients, *Wisconsin, Burning, Forests, Forest management, Hydrologic aspects, Forest watersheds, Watersheds(Basins), Forest soils, Rainfall, Overland flow, Hydrologic properties, On-site in-vestigations, Vegetation, Effects, Erosion, Soil physics, Forestry. Identifiers: *Spring burns, Oak-hickory forests.

Annual spring burns were applied for 1 to 3 years on a 25 to 50% slope in an oak-hickory forest in southwestern Wisconsin. Overland flow and sedimentation did not increase, although no severe storms occurred during tht study. Fires of light to moderate intensities consumed most of the fresh litter and sometimes all of the fermentation layer. Mean weight of litter plus fermentation layers mean weight of litter plus termentation layers were significantly reduced (alpha = 0.05) from 15,800 kg/ha to 10,100 kg/ha by three annual burns. Bulk density, total pore volume, organic carbon content, and water permeability of the mineral soil were unaltered. Stems less than 5 cm in dismater at breast height were killed but should be supported. in diameter at breast height were killed, but shrubs sprouted vigorously and herbaceous vegetation was not altered. Mean concentrations of both

anions (PO-P and (NO3 + NO2)-N) and cations (Ca, Mg, K) in the soil leachate collected at 15-cm depth appeared to increase after burning, although the differences were small and highly variable. Significant changes (alpha = 0.05) in the concentration of both anions were measured through the growing season. Concentrations of (NO3 + NO2)-N peaked 6 weeks after the mid-April fires, which reflects increased nitrification following burning. Sodium concentrations were not affected by burning. Although it was increased by burning, nutrient loss to deep leaching appeared to be approximately equivalent to, or less than, estimated annual input for a precipitation. (Sims-ISWS) W77-11613

WATER YIELD IMPROVEMENT BY VEGETA-

TION MANAGEMENT, Arizona Univ., Tucson. Coll. of Agriculture. For primary bibliographic entry see Field 3B. W77-11770

IMPACTS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT -PHASE III.

Washington Univ., Seattle, Coll. of Forestry. R. Zasoski, H. Dawson, and L. Lestelle. Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 410.

Price codes: A06 in paper copy, A01 in microfiche. Final Report (1977). 105 p, 35 fig, 10 tab, 16 ref, 5 append. OWRT C-6304(No. 5231)(1).

Descriptors: *Soil chemistry, *Water chemistry, *Anaerobic conditions, *Hydrogen ion concentration, *Acid streams, *Oxidation-reduction potential, Soil horizons, Salmonids, Forest soils, Liquid chromotography, Compaction, Organic matter, Calcium carbonate, Washington.

Identifiers: Quinault Reservation(Wash), Camp Creek Watershed(Wash).

On the Quinault Reservation (Washington State), areas of low stream pH have been correlated with reduced salmonid production. Causes of low stream pH were investigated in the Camp Creek Watershed using undisturbed soil columns and field lysimeters to monitor oxidation-reduction conditions, dissolved iron and organic matter, and solution pH. Both static and flow-through conditions were simulated in soil columns and solution pH modification was attempted by adding lime or wood ash to the column surface. Stream waters in upper Camp Creek appear to be equilibrating with the acid soils. Stream pH's of 4.5-5.0 would be expected in Camp Creek. pH reductions were also thought to originate from the oxidation of ferrous iron to ferric ions. Aeration of column effluents showed decreases in pH of up to 0.5 pH units; showed decreases in pri of up to 0.3 pri unus; however, dissolved organics seem to be stabilizing ferrous ion in solution. A slight rise in pH was found when lime and wood ash were applied. The large buffering capacity of the soil limited the effectiveness of these modifications. Similar results were found in attempts to modify stream pH by additions of lime and oyster shells. (See also W74-12355 and W75-08468)

A PLAN FOR A NATIONAL COASTAL WATER QUALITY MONITORING NETWORK.

QUALITY MONITORING NETWORK.
Interstate Electronics Corp., Arlington, Va. Environmental Engineering Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-236 636,
Price codes: A04 in paper copy. A01 in microfiche.
Report No. 445ES, Executive Summary, prepared for the Environmental Protection Agency, (1974).
53 p, 10 fig. EPA-68-01-0160.

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Descriptors: *Water quality control, *Monitoring, Pollution abatement, *Planning, *Environmental effects, Resources development, Coasts.
Identifiers: *Outer Continental Shelf, Coastal A national plan for coastal water quality monitoring is a vital step for this nation in the process of protecting our environment from irreversible degradation. Fragmented efforts at monitoring and control are ineffective and costly due to a lack of cooperation, uniformity and forward planning. To safeguard the quality of our coastal environment, a national monitoring system has been designed that will encourage conscious action and intel-ligent decisions for effective pollution abatement. An assessment was made of what is in existance now and what elements of existing plans are usea ble. The logical development of a national plan for monitoring requires that an overview of the problem first be obtained. The various levels of monitoring that have already been initiated at local, state and regional areas have been reviewed, evaluated, and incorporated into a plan which will allow immediate use of existing capabilities on a national basis. (Sinha - OEIS) W77-12147

COMPUTATION OF BACKWATER DISCHARGE AT WIDTH CONSTRICTIONS OF HEAVILY VEGETATED FLOOD PLAINS, Geological Survey, Bay Saint Louis, Miss. Water

Resources Div.; Geological Survey, Columbus, Ohio. Water Resources Div.; Geological Survey, Jackson, Miss. Water Resources Div.; and Geological Survey, Baton Rouge, La. Water Resources

V. R. Schneider, J. W. Board, B. E. Colson, F. N. Lee, and L. Druffel.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 418, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigation 76-129, February 1977. 64 p, 15 fig, 13 tab, 16 ref.

Descriptors: *Backwater, *Flow profiles, *Discharge measurement, *Numerical analysis, *Analytical techniques, Floods, Flood plains, Data collections, Mannings equation, Flow rates, Open channel flow, Bridges, Energy loss, Mississippi, Alabama, Louisiana. Identifiers: *Indirect discharge measurement,

Bridge backwater computation.

The U.S. Geological Survey, cooperated with the Federal Highway Administration and the State Highway Departments of Mississippi, Alabama, and Louisiana, to develop a proposed method for computing backwater and discharge at width constrictions of heavily vegetated flood plains. Data were collected at 20 single opening sites for 31 floods. Flood-plain width varied from 4 to 14 times the bridge opening width. The recurrence intervals of peak discharge ranged from a 2-year flood to greater than a 100-year flood, with a median interval of 6 years. Measured backwater ranged from 0.39 to 3.16 feet. Backwater computed by the present standard Geological Survey method averaged 29 percent less than the measured, and that computed by the currently used Federal Highway Administration method averaged 47 percent less than the measured. Discharge computed by the Survey method a 'eraged 21 percent more then the measured. Analyss of data showed that the flood-plain widths and the Manning's roughness coefficient are larger than those used to develop the standard methods. A method to more accurately compute backwater and discharge was developed. The difference between the contracted and natural water-surface profiles computed using standard step-backwater procedures is defined as backwater. The energy loss terms in the stepbackwater procedure are computed as the produ of the geometric mean of the energy slopes and the flow distance in the reach was derived from potential flow theory. The mean error was 1 percent when using the proposed method for computing backwater and 3 percent for computing discharge. (Woodard-USGS) W77-12152

4D. Watershed Protection

MATHEMATICAL MODELLING OF THE MINERALIZATION OF RIVER SYSTEMS. National Inst. for Water Research, Pretoria (South Africa). For primary bibliographic entry see Field 5B. W77-11570

WATER YIELD CHANGES AFTER THE UR-BANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND, University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-11600

A STUDY ON THE MOISTURE AVAILABILITY AND OTHER CONDITIONS OF UNSTABILISED DUNES IN THE CONTEXT OF PRESENT LAND USE AND THE FUTURE PROSPECTS FOR DIVERSIFICATION, Central Arid Zone Research Inst., Jophpur (India). H. S. Mann, A. N. Lahiri, and O. P. Pareek.

Annals of Arid Zone, Vol 15, No 4, p 270-284, December, 1976. 5 fig, 3 tab, 12 ref.

Descriptors: *Moisture availability, *Moisture Descriptors: "Moisture avaniability, "Moisture content, "Melons, "Sand dunes, Moisture stress, Arid lands, Plant growth, Transpiration, Deserts, Vegetation effects, Erosion, Soil conservation, Soil-water-plant relationships, Consumptive use, Crop production, Dry farming, Dunes, Soil moisture, Land use. Identifiers: *Rajasthan, India.

The prospects of plant production on desert dunes is considered with special attention given to prevailing soil-plant-environment conditions. The er study is western Rajasthan, India, of which 58 percent is covered with sand dunes. Soil moisture was determined gravimetrically and soil temperature was measured by thermistors. Transpiration was recorded by the quick weighing technique of Parker, and microclimatic observations were recorded by standard conventional equipment. The results are given. Most desert vegetation generally uses water at a high rate. Water utilization, however, varies among species and this is discussed. Utilization of moisture in barren dunes is also discussed and experiments with vegetation establishment on these dunes are presented. At present only melons are grown on the dunes. Cultivation on dunes induces erosion, but local farmers need the land and are likely to utilize the dunes. Therefore, it is suggested that suitable cropping patterns for dune areas be developed to reduce erosion hazards. (Jamail-Arizona) W77-11628

VEGETAL COVER TO ESTIMATE SOIL ERO-SION HAZARD IN RHODESIA,

Hatcliffe Engineering Centre, Barrowdale (Rhodesia). Dept. of Conservation and Extension. H. A. Elwell, and M. A. Stocking.
Geoderma, Vol 15, p 61-70, January, 1976. 4 fig, 2

Descriptors: "Vegetation establishment, "Soil erosion, "Erosion control, "Rainfall, Africa. Erosion, Erosion rates, Rain, Precipitation(Atmospheric), Rainfall intensity, Precipitation intensity, Rainfall-runoff-relationships, Raindrops, Soil moisture, Soil physics, Soil chemistry, Soil physical properties, Mathematical models.

Identifiers: "Cropping management, "American universal soil loss equation, "Rhodesia.

The role of vegetation establishment in helping control soil erosion in Rhodesia is examined. In addition, an alternative approach to the cropping management factor of the American Universal Soil Loss Equation which is more applicable

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4D-Watershed Protection

where financial resources are limited is presented. The use of percent vegetal cover as a spill loss estimation was measured in six treatments that produced a wide range of vegetal cover conditions. The soil was a medium grained fersiallitic sand on 4 percent slopes. Each treatment was replicated three times and soil loss and runoff were recorded for ten years. A simple linear model was developed which represented the amount of soil not protected by live or dead vegetation. Evidence is presented to show that percent vegetal cover is the major factor determining the erosion from crops and grassland in Rhodesia. (Jamail-Arizona) W77-11630

NOAA-ARS COOPERATIVE SNOW RESEARCH WATERSHED MATOLOGY AND DATA FOR WATER YEARS 1960-1974.

National Weather Service, Silver Spring, Md. Office of Hydrology. For primary bibliographic entry see Field 2C.

W77-11662

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER WATERSHED,

Tobacco Tax Council, Richmond, Va. For primary bibliographic entry see Field 6B. W77-11767

EROSION OF THE TARKIO DRAINAGE SYSTEM, 1845-1976, Agricultural Research Service, Columbia, Mo.

For primary bibliographic entry see Field 2J. W77-11796

OPTIMAL PREDICTION OF PONDING, Agricultural Research Service, Fort Collins,

For primary bibliographic entry see Field 2G. W77-11798

THE INTEGRATED HYDROLOGICAL CATCHMENT MODEL EGMO, Institut fuer Wasserwirtschaft, Berlin (East Ger-

many). For primary bibliographic entry see Field 2A. W77-11815

CONTROLS OF VARIATION IN SUSPENDED SEDIMENT CONCENTRATION IN THE RIVER ROTHER, WEST SUSSEX, ENGLAND, King's Coll., London (England). Dept. of Geology.

P. A. Wood. Sedimentology, Vol. 24, No. 3, p 437-445, June 1977. 5 fig, 12 ref.

Descriptors: *Suspended load, *Rating curves, *Watersheds(Basins), *Hysteresis, Suspended solids, Sediment discharge, Sediment distribution, Seasonal, On-site investigations, Hydrographs, Duration curves, Discharge(Water), Frequency, Storms, Foreign countries, Foreign

Identifiers: *England, *River Rother(England), Suspended sediment concentration.

Suspended sediment concentrations were determined for samples collected from the River Rother, West Sussex, and rating loops constructed for several hydrographs. The rating loops often exhibit hysteresis, with a greater suspended sedi-ment concentration for a given discharge occur-ring on the rising limb than on the falling limb. A comparison of the loops indicated that the hysteresis and the suspended sediment concentration (for a given discharge) become reduced progressively when storm events occur in rapid succession. Various types of rating curves can be identified, and a model of suspended sediment concentration and discharge can be constructed. Controlling factors of suspended sediment concentrations are river discharge, duration and frequency of the storm event, the length of time between successive events, and the time of year. (Humphreys-W77-11824

RAINFALL PARAMETERS TO PREDICT SUR-FACE RUNOFF YIELDS AND SOIL LOSSES FROM SELECTED FIELD-PLOT STUDIES, Rhodesia Dept. of Conservation and Extension,

For primary bibliographic entry see Field 2B. W77-11964

THE SWIRL CONCENTRATOR FOR EROSION RUNOFF TREATMENT, American Public Works Association, Chicago, Ill.

For primary bibliographic entry see Field 5D. W77-12080

CATCHMENT DESIGNING CONCEPTUAL MODELS FOR AUTOMATIC FITTING METHODS,

Ministry of Works, Wellington (New Zealand). For primary bibliographic entry see Field 2A. W77-12084

PROBLEMS OF APPLYING THE CONCEP-TUAL MODEL DEVELOPED FOR THE FLAT CATCHMENTS OF HUNGARY,

Research Inst. for Water Resources Development, Budapest (Hungary). For primary bibliographic entry see Field 2A.

W77-12087

REPRESENTATION OF A CATCHMENT BY A NETWORK OF RESERVOIRS

Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W77-12088

PHYSICO-STATISTICAL MODEL OF RAIN-FALL FLOOD FORMATION AND DETER-MINATION OF ITS PARAMETERS, Hydrometeorological Service of the USSR.

Moscow. For primary bibliographic entry see Field 2A. W77-12100

MATHEMATICAL MODEL OF HYDROMETEOROLOGICAL REGIME FOR-MATION OF A RIVER BASIN.

Gidrologicheskii Gosudarstvennyi Moscow (USSR). For primary bibliographic entry see Field 2A.

DETERMINISTIC AND STOCHASTIC MODELLING OF FLOODS IN MOUNTAIN RE-

GIONS, Kazakhskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Alma-Ata

For primary bibliographic entry see Field 2A. W77-12104

W77-12102

THE VELOCITY ASSUMPTION BEHIND INVARIABLE LINEAR WATERSHED RESPONSE MODELS,

Ministry of Agriculture, Jerusalem (Israel). Hydrological Service. For primary bibliographic entry see Field 2A. W77-12105

APPLIED PRINCIPLES OF CATCHMENT SIMULATION, Institut fuer Wasserwirtschaft, Berlin (East Ger-

For primary bibliographic entry see Field 2A. W77-12106

ROLE OF WES IN THE DEVELOPMENT OF HYDRODYNAMIC WATERSHED MODELS, Illinois Univ. at Urbana-Champaign.

Hilinois Univ. at Urbana-Cham Hydrosystems Section. For primary bibliographic entry see Field 2A. W77-12107

USE OF K-4 POLYMER IN INCREASING ANTIEROSIVE SOIL STABILITY IN IRRIGATION FURROWS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil

Melioration. For primary bibliographic entry see Field 3F. W77-12153

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975, Geological Survey, Austin, Tex. Water Resources

For primary bibliographic entry see Field 7C. W77-12155

COMPATIBLE SEDIMENT CONTROL PRAC-TICES AND TILLAGE SYSTEMS,

Tennessee Univ., Knoxville. Dept. of Agricultural Engineering.
F. D. Tompkins, C. H. Shelton, and J. E. Temple.
Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 16 p, 4 fig, 3 tab, 5

Descriptors: Sediments, *Sediment control, Flow resistance, *Soybeans, Run Watersheds(Basins), Return flow, Cultivation. Identifiers: *Tillage practices.

The results of this study indicate that pattern efficiency for a graded system was about the same as that for the conventional cropping pattern previously used. The angle at which the rows intersect the headland affects the time required for turning. Time required for turning increases as the intersection angle increasingly deviates from 90 degrees. Soybean yields obtained after land grading were somewhat higher than the station average. This suggests that, for the study area, soil disturbance due to land grading did not adversely affect yield. For specific runoff events occurring in early spring, sediment yield per cm of runoff on the original ungraded watershed was 85 percent less when the land was planted to wheat as compared to a fallow condition. After grading, the wheat-covered land yielded only 15 percent as much sediment per cm of runoff as that produced by the original watershed in wheat. The sediment yield per cm of runoff for the graded watershed in wheat was only about 2 percent of the yield from the original fallow watershed. (Skogerboethe original fallow Colorado State) W77-12181

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

MERCURY IN BOTTOM SEDIMENTS OF RIET-

VLEI RESERVOIR, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Chemistry. For primary bibliographic entry see Field 5B. W77-11512

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRA-TION IN THE WESER ESTUARY AND GER-MAN BIGHT, (IN GERMAN),

Institut fuer Meeresforschung, Bremerhaven (West Germany). M. Schulz-Baldes

Mar Biol (Berl). 21(2), p 98-102, 1973.

Descriptors: *Mussels, *Estuaries, Spectrophotometry, *Lead, *Bioindicators, *Pollutant identification, Water pollution sources.

Identifiers: *Weser estuary(W Germany), *German Bight(W Germany).

Common mussels were collected at 13 stations of the Weser Estuary and the German Bight in 3 size categories: 14-16 mm, 21-23 mm, 35-40 mm shell length. Equal numbers of the 3 groups from each station were analyzed separately for lead concentration by flameless atomic-absorption spec-trophotometry. The lead concentration of the soft parts decreases from 6.4 micrograms/g dry weight 15 km northwest of Bremerhaven to 1.9 micrograms/g at Helgoland (Germany). At the same station, the concentration in small mussels is significantly higher than in larger mussels. The lead concentration is exceptionally high in the kidney, quite high in the intestine (with the digestive lands) and in the adductor muscle, and low in the foot, gills, and mantle with gonads. Laboratory exents reveal that mussels directly reflect the actual lead concentration of their environment. The observed gradient in lead contents of M. edulis in the Weser Estuary can be explained by the dilution of the highly lead-polluted river water by the sea water of the German Bight. With this physiological property, M. edulis is highly suitable as an indicator organism for lead, and possibly other heavy metal pollutants.—Copyright 1974, Biological Abstracts, Inc. W77-11520

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC, Kanazawa Univ. (Japan). Radiochemistry Lab. T. Imai, and M. Sakanoue. J Oceanogr Soc Jap. 29(2), p 76-82, 1973.

Descriptors: *Pollutant identification, *Pacific Ocean, *Radioisotopes, Plutonium, Sea water, Coral, Thorium, Water pollution sources. Identifiers: China, Japan, *Plutonium-238, plutonium-239, *Protactinium-231, *Thorium-228, Thorium-230, Thorium-232, Yoron.

The contents of Pu isotopes (293Pu and 238Pu), Th isotopes (232Th, 230Th and 228Th) and Pa-231 in sea water collected in the North Pacific, the East China Sea and the Japan Sea were determined. These nuclides were sequentially analyzed by alpha-ray spectrometry after separating them mainly with solvent extraction technique. The contents of 239Pu in surface sea water ranged from 0.6-1.6 pCi/1000 I, 238Pu activity ratios being 0.2 equivalent to 0.7. The 228Th/232Th activity ratios for the North Pacific waters varied between 7.6 and 30, whereas the samples from the East China Sea showed the very high value, 65. The contents of 231Pa are less than 6% of that in equilibrium with its parent 235U. Analysis of Pu isotopes in recent coral from Yoron Island (Japan) confirmed that Pu isotopes have concentrated in recent coral with a concentration factor of about 1 equivalent to 2 x 1000. Copyright 1974, Biological Abstracts, W77-11527

SERUM IRON LEVEL AND TOTAL IRON BINDING CAPACITY IN CULTURE FISH, Tokyo Univ. of Fisheries (Japan). Radioisitope Research Lab.

Y. Ikeda, H. Ozaki, and K. Uematsu. J Tokyo Univ Fish. 59(1), p 43-53, 1972.

Descriptors: *Iron, Fish, *Rainbow trout, *Carp, Fish diets, Growth rates, Analytical techniques. Identifiers: Seriola-quinqueradiata, *Yellow-tail, *Serium iron level(Fish).

The serum iron levels, total Fe binding capacities and Fe saturation rates were determined by the Matsubara's and Ramsay's methods in 3 cultured fish, yellowtail (Seriola quinqueradiata), rainbow trout (Salmo irideus) and carp (Cyprinus carpio). The values for the 3 determinations are presented. In yellow-tail, the serum Fe level, unvarying dur-ing the period of June to Dec. directly correlated with the specific growth rate of body weight and dropped in fedding on the fish meal compound diets containing 0 or 27.3 mg% dry weight of Fe as iron succinate, but recovered in that added with 57.3 mg% of Fe. In rainbow trout, serum Fe level was higher in May than in March and indifferent to whether in freshwater or in seawater. In carp, the level, the lowest among the 3 species, was less than half as much as that in yellow-tail. The serum Fe levels seemed to be related to the species, activity, diet quality and water temperature. The total Fe binding capacities were almost the same in the 3 species. In yellow-tail, Fe saturation rate was the highest, but dropped with increased total Fe binding capacity when fed on the compound diet deficient in Fe. Between rainbow trout in freshwater and in seawater, slight differences were observed in total Fe binding capacity and Fe saturation rate. In carp, Fe saturation rate was the lowest. The feeding on the compound diet deficient in Fe caused a rise in total Fe binding capaci-ty and a decline in Fe saturation rate. The above 3 determinations might be helpful in diagnosing nutritional status or some diseases. The increase in total Fe binding capacity was attributed to a rise in Tf present in the 3rd fraction of serum protein in yellow-tail fed on the diet deficient in Fe.-Copyright 1974, Biological Abstracts, Inc. W77-11543

HEAVY METAL ENRICHMENT IN MINE DRAINAGE 2. THE WITWATERSRAND GOLD-

FIELDS,
Pretoria Univ. (South Africa). Dept. of Chemistry. For primary bibliographic entry see Field 5C.

PROBLEMS ENCOUNTERED WITH EDTA AS AN ANTICOAGULANT FOR FISH BLOOD,

Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology. G. L. Smit, and H. J. Schoonbee. South African Journal of Science, Vol 72, No 12, p 380-381, December 1976. 2 tab, 12 ref.

Descriptors: Sampling, Carp, Hydrogen ion concentration, Fish, Pollutant identification. *EDTA. Identifiers: South Africa. *Anticoagulants.

Fish have such a rapidly activated blood clotting mechanism that syringe needles become blocked during bloodsampling. It has been found, however, that if the stress to which fish are subject during collection is minimized, clotting can be delayed for 2-3 min. Klontz attributes this phenomenon to the retention of thrombocytes in the spleen and kidney. For blood sampling it is therefore essential to use a substance with good anticoagulant properties. Heparin, citrate, oxalate and EDTA have been used successfully as anticoagulants for fish blood, and of these Hesser found EDTA to be the most effective anticoagulant in the examination of blood cell morphole Heparin is the most widely used agent of this kind, probably because of the ease with which syringes and capillary tubing can be coated. EDTA powder, on the other hand, is unsuitable for this purpose because of its crystalline nature. Although Blaxhall stressed the importance of concentration when using EDTA as an anticoagulant, it is often observed that EDTA is added to the blood indiscriminately during routine haematological investigations. This unqualified use of EDTA prompted further investigations into the suitability and use of this agent as an anticoagulant. (So African Water Info Center) W77-11564

ABSORPTION AND ACCUMULATION OF 32P BY OEDOGONIUM AND SOME AQUATIC MACROPHYTES,

Randse Afrikaanse Universiteit, Johannesburg (South Africa). Navorsingsgroep Varswaterbiol. J. F. Vermaak, J. H. Swanepoel, and H. J.

Water SA, Vol. 2, No. 1, p 7-12, 1976. 5 figs, 1 tab.

Descriptors: *Phosphorus, *Aquatic weeds, Impoundments, Rivers, *Absorption, poundments, *Radioisotopes. Identifiers: South Africa, *Oedogonium, Macrophytes, Filamentous algae.

Absorption and accumulation of 32P by Oedogonium and nine species of water weeds commonly found in rivers and man-made lakes in the Transvaal, South Africa, were investigated. It is shown that different hydrophytes vary in their ability to absorp and accumulate this isotope. The filamentous alga, Oedogonium, shows a far better ability to accumulate 32P than any of the hydrophytes investigated. The highest average concentration factor value obtained for Oedogonium clearly ex-ceeds those obtained for Salvinia molesta and Myriophyllum brasiliense. (So African Water Info Center) W77-11569

PROGRESS OF STUDIES ON THE TYPE A (INFECTIOUS) HEPATITIS VIRUS IN WATER,

National Inst. for Water Research, Pretoria (South Africa). W. O. Grabow

Water SA., Vol. 2, No. 1, p 20-23, 1976. 2 fig, 23

Descriptors: *Viruses, Laboratory studies, *Public health, *Human diseases. Identifiers: South Africa, Lesser bushbabies,

The value of the latest findings on hepatitis viruses with regard to research on their incidence and behaviour in water is discussed. This includes the discovery that certain species of marmoset mon-keys may be susceptible to the type A and B viruses. Properties of virus-like particles, which may be the aetiological agents of viral hepatitis and their isolation from blood or faeces of infected humans or experimental animals, are summarized. The paper contains data on recent findings which indicate that lesser bushbabies (Galago senegalensis moholi) may be susceptible to the type A hepatitis virus. (So African Water Info Center) hepatitis vii W77-11571

REMOVAL OF MICROCYSTIS TOXINS IN WATER PURIFICATION PROCESSES,

National Inst. for Water Research, Pretoria (South Africa). J. R. Hoffmann

Water SA., Vol. 2, No. 2, p 58-60, 1976. 1 tab, 5

Descriptors: Water purification, Algae, Flocculation, Sedimentation, Chlorination, Filtration, Activated carbon, Algae toxins, Water pollution. Identifiers: South Africa, Microcystis aeruginosa.

Algal species such as Microcystis aeruginosa forma aeruginosa produce toxic substances which may have an ill effect when consumed. The ability of unit processes such as flocculation, sedimentation filtration and chlorination to remove dissolved algal toxins was investigated in the laboratory. These processes did not remove the toxins to below 'active levels' (as defined by the conditions

Group 5A-Identification Of Pollutants

of the investigation). Treatment with activated carbon, however, was successful in removing high concentrations of the toxins to below 'active levels'. (So African Water Info Center) W77-11576

METAL ENRICHMENT OF SEDIMENTS IN IN-LAND WATERS - THE JUKSKEI AND HEN-NOPS RIVER DRAINAGE SYSTEMS, Pretoria Univ. (South Africa). Dept. of Chemistry. For primary bibliographic entry see Field 5B. W77-11578

VANADIUM AND OTHER ELEMENTS IN GREENLAND ICE CORES, San Diego State Univ., Calif. Dept. of Chemistry. For primary bibliographic entry see Field 2C. W77-11586.

BIBLIOGRAPHY ON DISCHARGE MEASURE-MENT TECHNIQUES,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 10C. W77-11594

W77-11594

SUSPENDED SOLIDS MEASUREMENT GIVES IMPROVED CONTROL, Instruments (H. F.) Ltd., Bolton (Ontario). For primary bibliographic entry see Field 5D. W77-11624

RADIOACTIVITY IN MISSISSIPPI RIVER WATER,

Louisiana Water Resources Research Inst. Baton Rouge.

F. A. Iddings, and R. M. Knaus. Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 042, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1977. 36 p, 14 fig, 15 tab, 7 ref. OWRT A-039-LA(4), 14-34-0001-6019.

Descriptors: *Radioactivity, *Bioindicators, *Mississippi River, *Louisiana, Willow trees, Measurement, *Radioisotopes, Sampling, Monitoring, *Potable water, Water supply. Identifiers: *Black Willow.

Base line alpha, beta, and gamma radioactivity measurements for Mississippi River water are presented. The base line study encompasses 12 months. An evaluation of the change in radioactive content of the water as it passes down the river is presented. All results indicate a low radionuclide content for the river water during the period of study. A second section of the study details experience in sample handling and attempts at improvement of measurement. A simple filter system for measuring both alpha and beta particles using a GM tube is described. A novel technique for calibrating irregular geometry samples such as Marinelli beakers is also presented. A brief description of a simplified whole body counting procedure is included. Results are presented of studies to establish the possibility of using the Black Willow (Salix nigra Marsh.) as a biological indicator for radio-nuclides coming from nuclear power plants. On the basis of use of manganese and lanthanum as radiotracers and as post-experiment activated stable tracers, the willow roots ap-pear to be an excellent bioindicator. W77-11641

QUANTUM-MECHANICAL STUDIES OF EN-VIRONMENTAL EFFECTS ON BIOMOLECULES: 1. HYDRATION OF FORMA-MIDE.

Consiglio Nazionale delle Ricerche, Pisa (Italy). Laboratori di Chimica Quantistica. For primary bibliographic entry see Field 2K. W77-11645 TWO-TEMPERATURE MEMBRANE FILTER
METHOD FOR ENUMERATING FECAL
COLIFORM BACTERIA FROM
CHLORINATED EFFLUENTS,

Massachusetts Univ., Waltham. Dept. of Environmental Sciences.

Applied and Environmental Microbiology, Vol 33, No 6, p 1259-1264, June, 1977. 5 fig, 4 tab, 11 ref.

Descriptors: *E. coli, *Coliforms, *Sewage bacteria, *Analytical techniques, *Incubation, Sewage treatment, Enteric bacteria, Microorganisms, Cultures, Sewage, Waste treatment, Waste water treatment.

Identifiers: Multiple tube method, Membrane filter method.

Techiques for the recovery of fecal coliform bacteria from chlorinated sewage effluents using the standard membrane filter method (MF), the multiple-tube or most-probable-number (MFN) method, and a modified MF method were compared. Fecal coliform counts were determined for plant- and laboratory-chlorinated primary and secondary effluents. Results indicated that the MF method was much less effective than the MFN method, yielding only 14% of the recovery obtained by the MFN method. Modifications to improve recovery by the MF method were investigated by comparing counts obtained after using various preincubation periods (0, 3, 4 and 5 hours) at 35C. It was found that the preincubation for 5 hours at 35C prior to the standard 44.5C incubation period yielded the lowest recovery. Results obtained by the modified method (5 hours at 35C) were comparable to those obtained by the MFN method. Statistical comparisons for the various methods were prepared using the least squares method for best fit. (Schulz-FIRL)

TRANSVERSE-GRID WATER QUALITY
ANALYSES OVER THE SZOB-BUDAPEST
DANUBE SECTION
(KERESZTMETSZETHALOS
VIZSGALATOK A DUNA SZOB-BUDAPEST
KOZOTTI SZAKASZAN),
Kozepdunavolgyi Vizugyi Igazgatosag, Budapest

Kozepdunavolgyi vizugyi igazgatosag, Budapest (Hungary). M. Puskas.

Hidrologiai Kozlony, Vol. 52, No. 2, p 65-70, February, 1977. 4 fig, 1 tab, 4 ref.

Descriptors: *Water quality, *Chemical oxygen demand, Rivers, Streamflow, *Sampling, Organic loading, Waste assimilative capacity, Chemical analysis, Waste water disposal, Waste water treatment, Analytical techniques. Identifiers: Danube River, Hungary, Transverse-

rid system.

Analyses of water taken from a series of cross-sections along the Danube River have indicated that water quality is far from uniform along the stream. The transverse-grid system for collection was devised to insure optimal selection of sample points, representative samples, and reliable estimation of mass currents. Samples from the 7 cross-sections were collected at 4 occasions annually. Analytical results have been used to construct contour lines for flow velocity, depth, BOD5, COD (dichromate), ammonia, and ultraviolet absorption for several cross-sections. Pollutant levels were found to be higher for the left bank than for the right bank. It was suggested that the optimal number of sampling points is dependent on the component being investigated and the streamflow rate. Contoured diagrams for cross-sections can be used to determine the total amount of the component passing by any point in the river. (Schulz-FIRL)

BACTERIOLOGICAL ANALYSES OVER THE RAJKA-BUDAPEST DANUBE SECTION

(BAKTERIOLOGIAI VIZSGALATOK A DUNA RAJKA-BUDAPEST KOZOTTI SZAKASZAN), National Inst. of Public Health, Budapest (Hungary). Z. Deak.

Hidrologiai Kozlony, Vol. 52, No. 2, p 79-83, February, 1977. 1 fig, 3 tab.

Descriptors: *Coliforms, *Pathogenic bacteria, *Salmonella, *Sampling, *Spatial distribution, Rivers, Microorganisms, Aerobic bacteria, Streptococcus, Anaerobic bacteria, Clostridia, Sulfur bacteria, Bacteriophage, Biocontrol, Potable water, Industrial wastes, Municipal wastes, Pollutant identification, Analysis, Waste water treatment.

Identifiers: Danube River, Hungary.

Bacteriological studies have been conducted for 11 stations on the Danube River between Rajka and Budapest, Hungary. Quantitative determinations included analyses for: coliform, fecal coliform, fecal streptocci, heterotrophic mesophilic bacteria, psychrophilic bacteria, and sulfite-reducing spore-forming anaerobic Clostridia. Bacteriophages and Salmonellae were also investigated. A gradual increase in bacterial levels was observed from Rajks to Budapest, with characteristic peaks on the profile curve where four major tributaries enter the Danube. Seasonal variations in bacterial levels were attributed to the seasonal variations in effluents discharged by the area's sugar refineries. Although bacterial levels decreased slightly during the three year study, existing levels of bacteria and the presence of pathogenic bacteria such as Salmonella still prohibited bathing in the Danube and necessitated more costly treatment of drinking water. (Schulz-FIRL)

METHODS FOR THE EVALUATION OF THE RESULTS OF THE SELF-CONTROL-MEA-SUREMENTS CARRIED OUT BY THE SEWAGE TREATMENT PLANT OPERATIORS (VERFAHREN ZUR AUSWERTUNG DER BETRIERSERGEBNISSE VON KLAERWERKN).

Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft. D. Groche.

Wasserwirtschaft, Vol. 67, No. 6, p 154-161, 1977. 8 fig, 5 tab, 24 ref.

Descriptors: "Statistical methods, "Mathematical studies, "Frequency analysis, "Biochemical oxygen demand, "Integrated control measures, Flow control, Sewage treatment, Sludge treatment, Model studies, Mathematical models, Forecasting, Waste water treatment.

Identifiers: Cumulative-frequency distributions.

Statistical examination is presented as a means of more efficient treatment and operations control in waste water treatment plants. Most sewage treatment plants are operated on the basis on mean values of BOD and sewage flow. A more complete evaluation of fluctuations in BOD and sewage flow is suggested, using the standard deviation, coefficient of variability, and other statistical parameters. The number of measurements required for accuracy would be determined by the degree of control desired for a particular facility. Cumulative frequency curves produced by logarithmic plotting of BOD and sewage flow on probability graph paper are used to illustrate the effect of sample size and variability on the measurement distributions. (Schulz-FIRL)

MEMBRANE FILTER TECHNIQUE FOR THE QUANTIFICATION OF STRESSED FECAL COLIFORMS IN THE AQUATIC ENVIRONMENT,

Montana State Univ., Bozeman. Dept. of Microbiology. D. G. Stuart, G. A. McFeters, and J. E. Schillinger. Applied and Environmental Microbiology, Vol. 34, No. 1, p 42-46, July, 1977. 2 fig, 3 tab, 17 ref.

Descriptors: *Coliforms, *Sewage bacteria, *Analytical techniques, *Cultures, Effluents, Microorganisms, Meus-membrane filters, Laboratory tests, Bacteria, Chlorination, Sewage treat-ment, Waste water treatment, Pollutant identifica-

Identifiers: *Injury-mitigating membrane filtra-tion(IM-MF) technique, Most-probable-number(MPN) technique, Agar-membrane filter(Direct M-FC) method.

A method for the determination of coliform counts for fecal coliforms which have been injured by exposure to chlorine, industrial wastes, or marine waters is described. A modification of the membrane filter (MF) technique using injury-mitigating membrane filtration (IM-MF) was used for the analyses of effluents collected from several e treatment plant outfalls in Montana. For the IM-MF technique glycerol, acetate, and reduc-ing agents were added to both layers and the filter was rinsed with an enriched lactose medium for resuscitation. Results obtained with the IM-MF technique were compared with the multiple-tube or most probable number (MPN) technique and the agar-membrane filter (Direct M-FC) method. Fecal coliform counts in chlorinated sewage deterrecal conform counts in chlorinated sewage deter-mined by the IM-MF technique were significantly higher than those obtained by the MPN technique. A scattergram which illustrates the relationships between values obtained for IM-MF and MPN and for the direct M-FC and MPN is included. Results obtained by the various methods were similar for analyses of laboratory chlorinated sewage and mountain stream water. It is suggested that the IM-MF technique may provide a less costly, more accurate, and more easily performed alternative to the MPN technique for the quantification of fecal coliforms in chlorinated effluents. (Schulz-FIRL)

POLLUTANT REMOVAL FROM COAL-ASH BASIN EFFLUENT, Texas Univ. Health Science Center, Houston. School of Public Health. R. K. Guthrie, and D. S. Cherry. Water Resources Bulletin, Vol. 12, No. 5, p 889-902, October 1976. 5 fig, 4 tab, 8 ref.

Descriptors: *Pollutants, *Water pollution, *Drainage systems, *Basins, Water quality, Measurement, Abiotic environment, Metals, Toxicity, Waste treatment.

Identifiers: *Pollutant removal, *Chemical ele-ments, *Biotic characteristics, Neutron activation analysis, Plants, Animals.

The drainage system for an ash basin serving a coal-fired power plant at the Savannah River Project, Aiken, South Carolina, was studied for 15 months to determine abiotic and biotic characteristics and mechanisms of pollutant removal. Measurements made included temperature, dissolved oxygen, pH, turbidity, alkalinity, conductance, flow rate, sulfate, nitrate, and phosphate. Also, neutron activation analysis was employed to determine concentrations of 4d chemical elements in water. benthos. bacterial The drainage system for an ash basin serving a chemical elements in water, benthos, bacterial, lant, invertebrate, and vertebrate samples collected at six sampling stations. Five-day toxicity tests were performed using organisms from within and from outside the system. Temperature, dis-solved oxygen, turbidity, nitrate phosphate, and flow rate decreased at stations farther removed from the ash basin. Concentrations of most chemical elements measured were greatest in benthos and least in water, indicating that a major removal mechanism was sedimentation of suspended par-ticulate matter. Light metals were more highly concentrated in crayfish and mosquito fish than in benthos. Organisms found within the drainage system were observed to be able to survive a 5-day toxicity test at any point within the system, whereas orgainsms not existing within the system

were seen to vary in their resistance to the drainage system environment. (Bell-Cornell) W77-11784

INVESTIGATIONS ON PRECIPITATION FROM VARIOUS LOCATIONS IN NORWAY 1965-71, Direktoratet for Jakt, Viltstell og Ferskvannsfiske, Vollebekk (Norway). Fisheries Research Inst. For primary bibliographic entry see Field 2B. W77-11785

NUTRIENTS E BUDGET OF SELECTED MINERAL NUTRIENTS FOR TWO WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIED-Georgia Univ., Athens. Inst. of Natural Resources.

For primary bibliographic entry see Field 5B.

W77-11791

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART I: MEASURED EFFECTS ON CLOUDS.

Naval Weapons Center, China Lake, Calif. Research Dept. For primary bibliographic entry see Field 2B. W77-11805

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL. PART II: CALCULATED EFFECTS ON RAINFALL,

Naval Weapons Center, China Lake, Calif. Research Dept.
For primary bibliographic entry see Field 2B. W77-11806

SEDIMENT CONCENTRATION AND DURA-TION IN STREAM CHANNELS,

Denver Univ., Colo. Dept. of Geography For primary bibliographic entry see Field 2J.

POTENTIAL TRACE ELEMENT EMISSIONS FROM THE GASIFICATION OF ILLINOIS

Argonne National Lab., Ill. Energy and Environmental Systems Div.

N. F. Sather, W. M. Swift, J. R. Jones, J. L. Beckner, and J. H. Addington.

Available from the National Technical Information Service, Springfield, VA 22161 as ANL-75XX1, Price codes: A02 in paper copy, A01 in microfiche. Report No. ANL-75-XX-1, March 1975. 22 p, 2 fig, 3 tab, 4 ref, append. IIEQ 80.026, ERDA W-31-109-Eng-38.

Descriptors: *Air pollution, *Coals, *Trace elements, *Pollutant identification, analyses, Pollutants, *Illinois, Coal mines, Analytical techniques, Water pollution sources, Water quality, Analysis, Chemistry, Wastes, Natural gas, Arsenic compounds, Lead, Mercury,

Identifiers: *Coal gasification, *Synthetic gas, *Coal analysis, Arsenic, Mercury compounds, Lead compounds, Mineral constituents, Coal ashes, Lurgi Reactor.

Results of comprehensive trace element analyses of samples of Illinois No. 5 and No. 6 seam coals and the unquenched ashes obtained from gasification of these coals in a Lurgi reactor were reported and discussed. Areas where additional background information is needed for assessment of the environmental impact of trace element emissions from coal gasification were identified. (Henley-ISWS) W77-11827

PRECIPITATION NUTRIENTS IN THE OPEN AND UNDER TWO FORESTS IN MINNESOTA. Forest Service (USDA), Grand Rapids, Minn. North Central Forest Experiment Station. For primary bibliographic entry see Field 2K. W77-11831

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 2. SOUTHERN FLORIDA. Geological Survey, Tallahassee, Fla. Water

Resources Div. For primary bibliographic entry see Field 7C. W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975--VOLUME 1. NORTHERN FLORIDA.

Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-11877

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER, Helsinki Univ. of Technology, Otaniemi (Finland).

Radio Lab.

K. Kaski, and A. Laaperi. Available from the National Technical Information Service, Springfield, VA 22161 as N76-31733, Price codes: A02 in paper copy, A01 in microfiche. Radio Laboratory Report No. S 83, 1976. 19 p, 8 fig, 1 tab, 2 ref.

Descriptors: *Water pollution, *Remote sensing, *Monitoring, *Oil pollution, Equipment, *Pollutant identification, Micrwaves. Identifiers: *Outer Continental Shelf, *Oil slicks, *Baltic Sea, *Microwave radiometers.

Experiments were made with optical devices, such as multispectral photography, colour photography and low light television system, IR-scanner (thermal IR-region), near Ir photography, themal IR radiometer, microwave radiometer, air borne radar and shipborne radar. This report deals only with the microwave radiometer. At field tests several different oil types were released from boats. The experiments also included a release behind the oil barrier which was very successful because the thickness of the oil slick was great enough to be come clearly detected. The benefits of the microwave radiometer are the mapping capability at almost all kinds of weather both day and night, and the fact that it's possible to find the thickest part of the oil slick representing the biggest volume of the slick. The experiment gave an obvious demonstration of the usefulness of the microwave radiometer for thickness estimations in the case of thick oil film layers. The identification of oil types seems to be impossible with microwave radiometer. For operative use, e.g., surveillance or volume estimations, an imaging radiometer system is required. Such a system can also be used to localize the thickest part of oil slicks (Sinha - OFIS)

A SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE, Baird-Atomic, Inc., Bedford, Mass. Government

A. W. Hornig, J. T. Brownrigg, B. R. Chisholm,

A. W. Hornig, J. T. Brownrigg, B. R. Chisholm, and L. P. Giering.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-027 262, Price codes: A10 in paper copy, A01 in microfiche. Prepared for U.S. Coast Guard, Office of Research and Development Report No. CG-D-54-76, February 1976. 207 p, 37 fig, 31 tab. DOT-CC-3416A.

Descriptors: *Fluorescence, *Monitoring, *Oil pollution, *Water pollution, Equipment.

Group 5A-Identification Of Pollutants

Identifiers: *Outer Continental Shelf, Luminescence.

A significantly improved Oil-In-Water Content Monitor has been developed and tested. A major improvement involves the use of dual polychromators to present a total luminescence image. Using a computer-designed mask, the fluorescence from various spectral regions is summed to produce apvarious spectral regions is sufficient to produce ap-proximately equal response from many oil mix-tures. The monitor produces a real time output which is linear in oil concentrations and which can be calibrated directly in ppm. While the fluorescence process is essentially instaneous, instrumental response is determined by the electronic time constant selected, usually 1 second. Auxillary transmission and scatter channels permit correction of scattering from particulates. The monitor has been tested with seventeen oil mixtures from 0 to 125 ppm, showing linear response with a standard deviation of 25.9% (at 50 ppm) for all oils, and a standard deviaton of 18.1% when the heaviest oil mixture F2r, is omitted. Variations in temperature, pH and salinity have minimal effect on monitor accuracy. Fluorescent detergents may cause background problems; however future mask design can minimize background. The monitor responds linearly to oil ceoncentrations up to 1000 ppm and water-wetted particulate concentrations to 100 mg/l. Oil-wetted partulates decrease monitor output and remain a problem. Results of the laboratory test program are fully documented, potential problems are discussed, and recommendations are included. (Sinha-OEIS)

DEVELOPMENT OF HIGH PRESSURE LIQUID CHROMATOGRAPHIC TECHNIQUES,

New Mexico Univ., Alburque. Eric H. Wang Civil Engineering Research Facility.

E. A. Walters.

Available from the National Technical Inform Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 899, Price codes: A03 in paper copy, A01 in microfiche. Air Force Weapons Laboratory Technical Report No. AFWL-TR-75-234, May 1976. 48 p, 12 fig, 1 tab, 202 ref. F29601-74-C-0030.

Descriptors: Water pollution, *Pollutant identifi-cation, *Chromatography, Waste water, Water pollution sources, *Analytical techniques, Trace

elements, Organic wastes, Metals.
Identifiers: High Pressure Liquid Chromatography(HPLC), Detectors.

A continuing study of the application of High Pressure Liquid Chromatographic (HPLC) techniques to water pollution problems is reported. This effort was concerned with the procedures, column materials, and detectors needed to establish reliable and accurate identification of trace organics and metal ions present in natural waters as a con-sequence of industrial discharges from Air Force installations. Developmental data on three new de-tection systems—an ultrasonic velocity detector, a beta-induced luminescence detector, and a specific solid-state silver-ion detector-are given. Preliminary results of work on separations in natural waters and in sewage effluents using HPLC techniques and an extensive literature survey on HPLC are also included. (Sinha-OEIS)

SHIPBOARD OIL-IN-WATER MONITOR,

Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.

J. Bordeaux. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A028 785, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. FR-2677-101 to Naval Sea Systems Command, Washington, D.C., July 1976. 56 p, 22 fig, 4 tab. N00024-74-C-5445.

Descriptors: *Monitoring, *Oil pollution, Oily water, *Pollutant identification, *Reflectance,

Water pollution control, Water quality control, Analytical techniques, Automation, Equipment.

The design, fabrication and testing of an auto-mated oil-in-water content monitor is reported. A design concept was selected for development which contains the analytical features of the standard laboratory technique for measuring oil content in water. This involved solvent extraction of the oil and subsequent measurement of the in-frared energy absorbed by the C-H bond using at-tenuated total reflectance. Automation of the process was to be done by saturating a tape with solvent, impinging the oil/water sample onto the tape, allowing the oil to be extracted and migrate through the tape where, in contact with the surface of an internal reflecting element, IR absorption would occur in proportion to the amount of oil present. A safety hazards analysis revealed a potential solvent vapor problem. The practicality of separating oil from water and depositing it directly onto the tape was then determined. It was concluded that the limited engineering type tests conducted thus far were sufficient to show feasibility of the approach. While adequate sensitivity was apparent, it was found that control of several variables must be improved to achieve the specified level of accuracy. (Sinha - OEIS) W77-11910

ELECTROCHEMICAL CHLORINE FLUX MONITOR.

National Bureau of Standards, Washington, D.C. G. Marinenko.

Available from the National Technical Information Service, Springfield, Va 22161 as COM-75-11197, Price codes: A02 in paper copy, A01 in microfiche. Patent Applications, Serial No. 610,711, September 5, 1975. 13 p, 6 fig.

Descriptors: *Patents, *Monitoring, *Water quali-ty, *Water quality control, Measurement, Chlorine, Calibrations, Instrumentation, Elec-tronic equipment, *Water treatment, Pollutant

The object of the invention is to provide an apparatus for measuring the concentration of chlorine in water which has a built-in, self-contained calibration means. A water sample is mixed with a solution of potassium iodide and the reaction produces a mole of iodine for every mole of chlorine present in the water. The mixture is passed through a detection and calibration assembly where the iodine is detected amperometri-cally by a detection cell. Calibrant (known) iodine fluxes, equivalent in effect to the unknown chlorine-produced iodine fluxes, are supplied to the detection cell during calibration runs by means of an upstream calibration cell which electrolyzes the iodine (preferably added to distilled water) to iodine at flux rates given simply by the electrolyzing currents divided by Faraday's constant. An electronics package having gain and offset controls and a concentration display is provided. (Sinha - OEIS) W77-11915

COMPOSITE SAMPLING METHOD AND SYSTEM.

artment of the Interior, Washington, D.C.

E. J. Peterson.
Patent Serial Number 622,344. Filing Date 14. October 1975. 14 p, 3 fig.

Descriptors: *Patents, *Sampling, *Water sampling, Automation, On-site investigations, Flow, Effluents, Equipment, Pollution identification. Identifiers: Fish hatchery effluent.

The invention provides a low cost, reliable, automatic composite sampler which periodically col-lects composite samples without technician intervention and which collects samples not altered or biased. The composite sampler is comprised of a high velocity electric pump for drawing fluid such as water from a high velocity hatchery discharge into a sample chamber having inlet and outlet valves controlled by a negative hydraulic pressure. During a sampling cycle, the negative hydraulic pressure in the sample chamber, generated by the pump, opens an inlet valve and an outlet valve of the chamber to establish high velocity fluid flow from the sampling point at the discharge, through the sample chamber and pump, and back to a the sample chamber and pump, and back to a reservoir. The fluid is drawn into the sample chamber at a flow velocity equal to or greater than the flow velocity of the fish hatchery discharge to avoid biasing the samples. When the pump is deenergized at the end of the sampling cycle, the force of gravity and back pressure close the inlet and outlet valves and open a second outlet valve in the sample chamber to drain the contents of the chamber to a collection container. (Sinha-OEIS)

EVALUATION OF POTABLE WATER AS A VEHICLE OF TRANSMISSIBILITY AND VIA-BILITY FOR HERPESVIRUS,

North Dakota State Univ., Fargo. Dept. of Virology and Pharmacology.
For primary bibliographic entry see Field 5B.
W77-11935

THE DIFFERENTIATION OF INORGANIC AND ORGANOMERCURY SPECIES IN AQUEOUS

North Dakota Univ., Grand Forks. Dept. of Chemistry.

R. Baltisberger.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 439, Price codes: A03 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report, WI-221-041-76, July 1977. 34 p., 7 tab, 2 fig, 14 ref. OWRT A-050-NDAK(I), 14-34-0001-7071, 14-34-0001-7072.

Descriptors: *Analytical techniques, Aquatic microorganisms, *Cations, *Mercury, Met *Water analysis, Water quality standar *Pollutant identification, *Spectrophotometry. standards. Identifiers: Mercury compounds, Methylmercury.

Mercury in environmental water samples can exist in several forms such as Hg2+, Hg2+, Hgo and CH3Hg+. Methylmercury cation, CH3Hg+ is formed by the methylation of Hg2+ by aquatic microorgainsms. Metallic mercury (Hgo) has a solubility of 3 x 10-7 moles/liter (60 ppb) at 250 and is in equilibrium with Hg2+ and Hg22+. The fate and form of mercury compounds in aqueous solu-tion involve complex interactions. In order to adequately establish water quality standards for this element, it is desirable to have analytical techniques available capable of differentiation of the exact forms of mercury in environmental water samples. An analytical technique was developed and tested for the measurement and differentiation of inorganic and organic mercury cations in environmental samples and their utimate analysis by flameless atomic spectrophotometry. The method is useful in the concentration range from 10 to 100 ppb Hg22+, Hg2+ or Ch3Hg+.

CHANGES IN AQUATIC MACROPHYTES AC-COMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA, Cornell Univ., Ithaca, N.Y. Center for Environ-

mental Research.

B. L. Markham, W. R. Philipson, T. Liang, and D.

Available from the National Technical Informa-Avanable from the National Technical Information Service, Springfield, VA 22161 as PB-272 441, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, August 1977. 45 p, 17 fig, 5 tab, append. OWRT A-069-NY(1), 14-34-0001-7067/7068. Descriptors: *Remote sensing, *Aerial photography, *Aquatic plants, *Mapping, *Eutrophication, *Phosphorus, *Tertiary treatment, *Nutrient removal, *Pollutant identifica-

Large scale, multi-year, color and color infrared aerial photographs were used to evaluate changes in aquatic vegetation that have accompanied a reduction in phosphorus inputs to a phosphorus-limited, eutrophic lake in New York State. The study showed the distribution of emergent, float ing and submersed vegetation could be determined with little or no concurrent ground data; that various emergent and floating types could be separated and, with limited field checks, identified; and that different submersed types are generally not separable. Major vegetative types were characterized by spectral and non-spectral features, and a classification was developed for compiling time-sequential vegetation maps. Based on these maps, it was found that emergent and floating vegetation changed in composition but relatively little in total area, while the area of sub-mersed vegetation increased fourfold. Although the caused vegetator interested to the changes could be many, the photographic and limnological data suggest that the changes were not a consequence of decreasing phosphorus inputs to the lake. W77-11940

EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL SAMPLING,

Florida Univ., Gainesville. Dept. of Microbiology; and Florida Univ., Gainesville. Dept. of Soil

F. B. Dazzo, and D. F. Rothwell.

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41. 3, 5 Applied Microbiology, V. 27, p 1172-1174, June, 1974. 1 fig, 7 ref.

*Soil Descriptors: water, *Bacteriology, Coliforms, Farm wastes, Pollutant

The validity of obtaining soil water for fecal coliform analyses by porcelain cup soilwater sam-plers was examined. Numbers from samples of manure slurry drawn through porcelain cups were reduced 100- to 10,000,000-fold compared to numbers obtained from the external manure slurry, and 65% of the cups yielded coliform-free sam-ples. Fecal coliforms adsorbed to cups apparently were released, thus influencing the counts sequent samples. Fecal coliforms persisted in soil water samplers buried in soil and thus could significantly influence the coliform counts of water samples obtained a month later. These studies indicate that porcelain cup soil water samplers do not yield valid water samples for fecal coliform analyses. (East Central) W77-11968

NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS, North Carolina State Univ. at Raleigh. Dept. of

Biological and Agricultural Engineering. For primary bibliographic entry see Field 5B. W77-11980

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING

SOIL WATER,
Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station.
B. F. Quin, and L. J. Forsythe.
New Zealand Journal of Science, Vol. 19, p 145-148, June, 1976, 2 fig, 11 ref.

Descriptors: *Lysimeters, *Soil water, *Percolation, *Water sampling, Moisture content, trigation, Instrumentation, Waste water(Pollution), Sewage, Effluents, Sewage effluents, Groundwater, Sampling, Pollutant identification. Identifiers: *All-plastic suction lysimeters. The changes in composition of percolating soil and ground waters are of special interest in operations involving irrigation, particularly with waste waters and sewage effluents. Soil-water sampling techniques employing suction through a porous ceramic cup have come into increasing use in recent years, but have several disadvantages. These disadvantages are discussed. All-plastic suction lysimeters do not suffer from these disadvantages. Their construction and operation are described. The differences between permanent and removable lysimeters are also outlined. Conclusions are presented. The all-plastic suction lysimeters enable percolating soil water to be sam-pled rapidly for both chemical and microbiological analysis, without risk of contamination. (Jamail-Arizona)

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - I. ANALYTICAL RESULTS OF THE BLOOD AND BONES, (IN JAPANESE),

Kyushu Univ., Fukuoka (Japan). Dept. of Fishe-

J. Koyama, and Y. Itazawa. Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 5, p 523-526, 1977. 6 fig, 15

Descriptors: *Metals, *Cadmium, *Carp, Fish, *Fish physiology, Fish behavior, Biochemistry, Mode of action, Analytical techniques, Bioassay, Path of pollutants, Freshwater fish, Laboratory tests, Phosphorous compounds.
Identifiers: Bioaccumulation, Tissue analysis.

Carp were administered feed containing 0, 28, 140, 570, 1700, or 5700 ppm of Cd for 30 and 60 days. Alkaline phosphatase activity decreased, as well as Cd content in serum, vertebrae, and cranial and vertebral ash. Inorganic phosphate concentration in serum increased with increasing Cd content. Violent swimming behavior and tetany were observed in some of the fish. This activity was thought to be due to hyperexciteability of the nervous and muscle systems by low Ca and high inornic P levels in the plasma. (Klein) W77-12012

ORGANOCHLORINES AND HEAVY METALS IN THE HARBOUR SEAL PHOCASVITULINA FROM THE GERMAN NORTH SEA COAST, Kiel Univ. (West Germany). Institut fuer Haustier-

For primary bibliographic entry see Field 5C. W77-12015

DETECTION OF TRACE CONTAMINANT EF-FECTS IN AQUATIC ECOSYSTEMS, Geological Survey, Menlo Park, Calif.

S. N. Luoma. Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 436-439. 17 ref.

Descriptors: *Toxicity, *Insecticides, *Pesticides, *Metals, *Phytoplankton, Scenedesmus, Polychaetes, *Copper, *Cadmium, *Lead, *Zinc, Estuaries, Water pollution effects, Environmental effects, Resistivity, Chlorella, Pollutant identifica-

Identifiers: Trace contaminant effects.

If one population of a species is more resistant to a toxicant than are other populations, it is direct evidence that the concentration of the toxicant in the environment of the resistant population is sufficient to elicit biological effects. The presence of a toxicant-resistant population of one species in an ecosystem further suggests that other species may have been affected by the resistance-eliciting substance. (Katz) W77-12017

CRUSTACEAN ZOOPLANKTON COMMUNITIES AS INDICATORS OF LIMNOLOGICAL CONDITIONS: AN APPROACH USING PRINCIPAL COMPONENT ANALYSIS, TOYONG Univ. (Ontario). Dept. of Zoology.

W.G. Sprules.

Journal of the Fisheries Research Board of Canada, Vol 34, p 962-975, 1977. 4 fig, 6 tab, 36

Descriptors: *Zooplankton, *Statistical methods, *Sampling, *Analytical techniques, *Bioindicators, *Mathematical studies, Numerical analysis, Systematics, Limnology, Aquatic en-vironment, Methodology, Crustacea, Pollutant identification. identification.

Identifiers: Zooplankton communities, *Principal component analysis, *Multivariate analysis, Numerical taxonomy.

Principal component analysis was used to develop a technique for predicting the limnological charac-teristics of a lake from knowledge of its midsummer limnetic crustacean zooplankton community. Patterns of variation in zooplankton commu-nity structure were summarized in the principal components extracted, via the species covariance matrix, from the matrix of transformed proportionate numerical abundances of species in a sample of lakes. The relation between these patterns and the limnological characteristics of the lakes was determined from the first-order rank correlations of the limnological variables with the components. These patterns were contrasted with those extracted from the same data using more subjective techniques. The usefulness of the technique and some modifications were discussed. W77-12029

EFFECT OF SHOCK EXPOSURES OF CHLORINE ON THE PLASMA ELECTROLYTE CONCENTRATIONS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI), Consumers Power Co., Jackson, Mich. Dept. of Environmental Services.

For primary bibliographic entry see Field 5C. W77-12031

RELATIONSHIPS BETWEEN HEAVY METALS AND MAJOR CATIONS ALONG POLLUTION GRADIENTS,

Durham Univ. (England). Dept. of Botan For primary bibliographic entry see Field 5B. W77-12033

DETERMINATION OF MERCURY IN FISH FROM RIVERS AND LAKES IN HUNGARY BY ATOMIC ABSORPTION TECHNIQUE,

Aronic Albartion, Budapest (Hungary).

A. Gergely, K. Soos, L. Erdelyi, and V. Cieleszky.
Toxicology, Vol 7, p 349-355, 1977. 1 fig, 3 tab, 10

Descriptors: *Mercury, *Water pollution sources, *Analytical techniques, *Laboratory tests, *Chemical analysis, Metals, Public health, Water pollution, Heavy metals, Poisons, Pollutant identification, Path of pollutants, Wastes.

Identifiers: Tissue analysis, *Danube River(Hungary), *Atomic absorption technique.

In this study total mercury content in fish from rivers and lakes in Hungary was measured. The mercury content in fish muscle-tissue from 164 fish samples averaged 0.36 mg/kg. Average levels in different fish species ranged from 0.10 to 0.57 mg/kg. The amount of mercury in fish from rivers and lakes, with the exception of the Danube, was, in general, lower than the tolerance level (0.50 mg/kg) as adopted in many countries. Mercury levels in fish from Lake Belaton did not amount to more than 0.30 mg/kg. The circulating cold vapour atomic absorption method was used to determine the mercury content in the fish samples. (Katz) W77-12037

Group 5A-Identification Of Pollutants

YGENATION RATES IN EXPERIMENTAL CONTAINERS,

Colorado Cooperative Fishery Unit, Fort Collins. For primary bibliographic entry see Field 7B.

CHARACTERIZATION OF SUSPENDED PARTICLES IN SOME PULP AND PAPER MILL EF-FLUENT PLUMES, Canada Centre for Inland Waters, Burlington

(Ontario).

For primary bibliographic entry see Field 5B. W77-12058

A QUANTITATIVE STUDY OF THE INVER-TEBRATE FAUNA OF THE RIVER TEES BELOW COW GREEN RESERVOIR,

Freshwater Biological Association, (England). Cow Green Lab. For primary bibliographic entry see Field 5C. W77-12060

A NOTE ON TOXAPHENE IN ENVIRONMEN-TAL SAMPLES FROM THE CHESAPEAKE BAY REGION.

Westinghouse Ocean Research Lab., Annapolis, Md

For primary bibliographic entry see Field 5B. W77-12062

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5B. W77-12065

ACUTE TOXIC EFFECTS OF TWO LAMPRI-CIDES TO TWENTY-ONE FRESHWATER IN-

Bureau of Sport Fisheries and Wildlife, Miller-sburg, Mich. Hammond Bay Biological Station. For primary bibliographic entry see Field 5C. W77-12071

OCCURRENCE OF ESCHERICHIA COLI B BACTERIOPHAGES IN MUNICIPAL WASTE-WATER AND THEIR REMOVAL AND INAC-TIVATION BY ACTIVATED SLUDGE SEWAGE TREATMENT.

Miami Univ., Fla. F. G. Estevez PhD Thesis, 1976. 138 p.

Descriptors: *Coliforms, *E. coli, *Activated Studge, "Bacteriophage, "Sewage bacteria, Anaerobic digestion, Suspended solids, Sludge digestion, Chlorination, Microorganisms, Waste treatment, Waste water treatment.

A modified plaque assay was used to examine the occurrence of E. coli B bacteriophages during various stages of the activated sludge treatment process. It was observed that coliphages, associated with suspended solids, may increase during the treatment process. Settled solids were found to contain more than 10,000 plaque-forming units per milliliter. Coliform bacteria and coliphages were reduced during anaerobic digestion of sludge, and inactivated by physical rupture of the virions during adsorption to suspended solids. Survival of coliphages after heavy chlorination was reported. (Shulz-FIRL) W77-12140

OPTIMIZATION AND EVALUATION OF FLUORESCENCE OIL SPILL DETECTO FLUORESCENCE OIL SPILL DETECTOR.
VOLUME 2 - PROTOTYPE DESIGN,
Baird-Atomic, Inc., Bedford, Mass.
H. G. Eldering, and W. A. Webb.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as AD-A016
464, Price codes: A03 in paper copy, A01 in
microfiche. U.S. Coast Guard Office of Research
and Development Report No. CG-D-109-75, May 1975. 26 p. 5 fig. 2 tab. DOT-CG-43845-A.

Descriptors: *Oil spills, *Oil pollution, *Monitoring, *Remote sensing, *Water pollution sources, Fluorescence, Equipment.
Identifiers: *Outer Continental Shelf, Pollutant detection.

The operational and technical requirements of a low cost harbor surveillance unit is reviewed and the design of a Scanning Oil Spill Detector is described. Operational considerations such as coverage resulted in a design containing both azimuth and elevation scanning. The incremental cost of scanning is less that the cost of additional control of the cost of additional coverage. units needed to provide the additional coverage. Space has been allotted for an optional alarm reporter (FM transmitter) within the base. The unit is purged and pressurized with dry nitrogen to provide safe operation in explosive atmospheres. Field tests indicated a complex criterion is needed to achieve the desired false alarm rate of one per year. A low cost minicomputer is used to control scanning, alarm in the presence of oil, and provide an alarm if the detector malfunctions. (Sinha -W77-12145

WATERFOWL REFUGE EFFECT ON WATER QUALITY: II. CHEMICAL AND PHYSICAL PARAMETERS.

New Mexico Inst. of Mining and Technology,

D. K. Brandvold, C. J. Popp, and J. A. Brierley. Journal Water Pollution Control Federation, Vol. 48, No. 4, p. 680-687. April 1976. 9 tab, 10 ref. OWRT A-038-NMEX(5).

Descriptors: "Water quality, "Water pollution sources, "Eutrophication, "Wildlife, Water quality control, "Mercury, Fish, Chemical oxygen demand, Biochemical oxygen demand. Identifiers: "Bosque del Apache Wildlife Refuge(NM), "Waterfowl, Socorto(NM).

The Bosque del Apache Wildlife Refuge south of Socorro (NM) was studied to determine effects of waterfowl on overall water quality. Eight sampling stations were established. Samples were taken between July 1970 and May 1973. Physical parameters were: pH, temperature, specific conductance, dissolved oxygen (DO), total dissolved solids (TDS) and sediment. Chemical parameters solids (TDS) and sediment. Chemical parameters were: silica, dissolved phosphate, sulfate, nitrite, chloride, chemical oxygen demand (COD), mercury (organic and inorganic), total phosphate, bicarbonate, carbonate, sodium, potassium, calcium, magnesium, Kjeldahl nitrogen, ammonia, hydrolized nitrogen, urea, uric acid. Data were considered valid if the difference between the number of millequivalents of cations and millequivalents of anions was less than 10%. Water leaving the refuge was compared with water enterwo general trends in fish analysis were observed: the larger and more carnivorous fish contained the most mercury, and since the liver and kidney absorb mercury, the muscle tissue that is eaten contains less mercury than is reported for the entire fish. Conclusions were: waterfowl decrease amounts of nitrogen compounds and available phosphorus and increase biological oxygen demand, suggesting potential eutrophication problems; wric acid collects in sediment and is absorbe d by plants since it is insoluble in the Rio Grande River; the high sediment concentration in-creases concentration of various chemicals through a process of absorption; salinity should be analyzed before impounded water is released; Kjeldahl nitrogen, nitrite, COD, BOD and phosphate should be monitored as indicators of eutrophication and oxygen deficit problems. (See also W77-02513) (Gentry - North Carolina) W77-12148

HYDROLOGIC EVALUATION OF THE UPPER DUCHESNE RIVER VALLEY, NORTHERN UINTA BASIN AREA, UTAH, Geological Survey, Salt Lake City, Utah. Water

For primary bibliographic entry see Field 4B. W77-12158

FOR HOLDING AQUATIC CHAMBER MICROINVERTEBRATES DURING TOXICITY TESTS IN A FLOW-THROUGH DILUTER SYSTEM,
Wyoming Univ., Laramie. Dept. of Zoology and

Physiology.
G. M. DeGraeve, T. Crutzen, and R. W. Ward. The Progressive Fish-Culturist, Vol 39, No 2, p. 100-101, 1977. 1 fig, 3 ref.

Descriptors: Research and Development, Design, *Methodology, Regulated flow, *Equipment, *Research equipment, Design criteria, Model studies, Aquatic microorganisms, Bioindicators, Invertebrates, Copepods, Toxicity, Mortality,

Identifiers: *Toxicity testing, *Flow-through diluter system, Microinvertebrates.

A test chamber to be used in conjunction with a flow-through diluter system and a standard egg incubation apparatus was designed to simplify bioassays with microinvertebrates. Design and construction criteria were described as well as operational procedures of the apparatus. Recovery of the microinvertebrates tested, including species of copepods, ostracods, and cladocerans, was estimated at 95%. (Katz) W77-12185

TOXICITY BIOASSAYS WITH PERIPHYTON COMMUNITIES: DESIGN OF EXPERIMENTAL STREAMS.

Minnesota Univ.-Duluth. Dept. of Biology D. Z. Gerhart, S. M. Anderson, and J. Richter. Water Research, Vol 11, p. 567-570, 1977. 6 fig, 1 tab, 4 ref.

Descriptors: *Toxicity, *Bioassay, *Periphyton, Design, *Methodology, *Diatoms, *Artificial water courses, Aquatic life, Technology, Biomass, Biological communities, Aquaria, Research and development, Aquatic microorganisms, Laboratory tests

Identifiers: Experimental streams, Diatom community structure.

A method for conducting toxicity or enrichment bioassays using periphyton communities was described. Communities consisting of 35-55 species of diatoms are grown in plastic laborat streams which may be operated as flow through or recirculating systems. Replication of community biomass, species composition and diversity in these streams was excellent, and the communities were easily sampled. The effects of nutrients, heavy metals or other soluble toxins may be assayed in experiments lasting 3-5 weeks. (Katz) W77-12188

A BOTTLE HOLDER FOR IN SITU PRIMARY PRODUCTIVITY STUDIES,
Battelle Columbus Labs., Ohio. Ecology and

Ecosystems Analysis Section. R. D. Burkett, and D. R. Taylor. The Progressive Fish Culturist, Vol 37, No 2, p.

112, 1975. 2 fig.

Descriptors: Design, Research and development, *Research equipment, Equipment, Costs, *Primary productivity, On-site investigations, *On-site data collections, On-site tests, Light intensity, Light penetration, Growth Methodology.
Identifiers: Bottle holder, Incubation bottles.

A holder which supports bottles horizontally in the water column was fabricated. Such positioning was designed to increase primary productivity rates, allow in situ suspension, and maximize light incidence. Design, costs, an procedures were outlined. (Katz) W77-12189 and construction

DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS, Life Systems, Inc., Cleveland, Ohio.

R. J. Davenport, and R. A. Wynveen. Available from the National Technical Information tion Service, Springfield, VA 22161 as AD-A026 629, Price codes: A05 in paper copy, A01 in microfiche. Report LSI ER-285-3, June 1976. 75 p, 31 fig, 10 tab, 19 ref.

Descriptors: *Design, *Research and development, *Research equipment, *Methodology, *Monitoring, *Solutes, *Electrochemistry, Effluents, Control systems, Suspended solids, Wastes, Analytical techniques, Methodology, Ox-Identifiers: *Electrochemical organic content

analyzer, *Monitors.

The Electrochemical Organic Content (EOC) Analyzer and three New Technology Analyzers were conceptually designed and evaluated. The four analyzers were feasible approaches to monitoring organic solute concentrations in the effluent of the Water Processing Element (WPE) of the Medical Unit, Self-Contained, Transportable (MUST) Army field hospital. The New Technology Analyzers were the Electrochemical Total Oranic Carbon (TOC) Analyzer, the Electrochemical Chemical Oxygen Demand (COD) Analyzer and the Electrochemical Total Oxygen Demand (TOD) Analyzer. The feasibility of a laboratory breadboard version of the EOC Analyzer was experimentally demonstrated. Results, conclusions and recommendations were presented. (Katz) W77-12199

LOW ENVIRONMENTAL PH IN-FLUENCE HEPATIC GROWTH IN FISH, Oslo Univ. (Norway). Inst. of Zoology. For primary bibliographic entry see Field 5C.

DISPOSABLE ELECTRODE CHAMBER FOR MEASURING OPERCULAR MOVEMENTS OF

FATHEAD MINNOWS, Environmental Research Lab.-Duluth, Minn.

The Progressive Fish-Culturist, Vol 39, No 2, p 94, 1977. 1 fig. 1 ref.

Descriptors: *Methodology, Research and development, *Research equipment, Design, *Design criteria, *Electrodes, Equipment, Fish, Fish behavior, Model studies, Fish physiology, *Respiration, *Minnows.
Identifiers: *Disposable electrode chamber,

*Fathead minnow, Opercular movement.

A simple, disposable chamber to measure the opercular movements of fathead minnows, Pimephales promelas, was described. Design and construction criteria were presented as well as operational procedures and advantages for using this method. (Katz)

TEMPERATURE SAFETY DEVICE FOR AQUATIC LABORATORY SYSTEMS, Environmental Protection Agency,-Duluth, Minn. For primary bibliographic entry see Field 7B.

ELECTRONIC CONTROLLER FOR PRODUCING CYCLIC TEMPERATURES IN AQUATIC STUDIES,

Academy of Natural Sciences of Philadelphia. Benedict, Md. Benedict Estuarine Lab For primary bibliographic entry see Field 7B. W77-12208

VERGLEICHENDE PRUFUNGEN DER FISCHTOXIZITATEN AN ELRITZEN FOREL LEN UND GOLDORFEN (COMPARATIVE TESTS ON TOXICITY TO FISH USING MIN-NOWS, TROUT, AND GOLDEN ORFE), (IN GERMAN) GERMAN),
Farbenfabriken Bayer A.G., Leverkusen (West

B. Hamburger, H. Haberling, and H. R. Hitz. Archiv fur Fischwissenschaft, Vol 28, No 1, p 45-55, 1977, 2 tab, 17 ref.

Descriptors: Freshwater fish, *Trout, *Minnows, *Toxicity, Mortality, Toxins, Salts, Metals, Dyes, Rainbow trout, Salmonids, Resistance, Metabolism, Path of pollutants, Bioassay, Environmental effects, Absorption, Methodology. Identifiers: Bioaccumulation, Golden orfe, Com-

parative toxicity.

Statements on the effects of chemicals on fish are required more and more frequently. For this reason, the fish species used most commonly for tests at out latitudes, the minnow (Phoximus laevis), and the rainbow trout (Salmo gairdnerii), and the golden orfe (Leuciscus idus L.), which have been used very frequently over the past few years, were subjected to a comparative test by seven companies in the chemical industry. The tests were carried out with three dyestuffs, three auxiliaries and one heavy metal salt. The golden orfe were tested using a static test in line with the German proposal for testing the effect of chemi-cals on fish, and the trout were tested using the US standard methods. The continuous test arrange-ment for trout followed the recommendations laid down by Alabaster, and the method submitted by the French Institut National Recherche Chimique Applique (IRCHA) in draft form was used for the minnows. The results of these tests indicated that minnows, trout and golden orfe normally show similar sensitivity. (Klein) W77-12212

SEALED-JAR BIOASSAYS FOR PULPMILL EF-FLUENT TOXICITY: EFFECTS OF FISH SPECIES AND TEMPERATURE,

British Columbia Research Council, Vancouver. Div. of Applied Biology.
M. R. Gordon, and D. J. McLeay.

Journal of the Fisheries Research Board of Canada, Vol. 34, p. 1389-1396, 1977. 3 fig, 1 tab, 29

Descriptors: *Bioassay, *Pulp wastes, *Effluents, *Toxicity, *Salmonids, *Salmon, *Temperature, Research equipment, Water quality, Water pollu-Methodology, Rainbow trout, Laboratory tests.
Identifiers: *Coho salmon, *Sealed-jar bioassays. Industrial wastes,

To standardize the sealed-jar bioassay for op-timum sensitivity to whole bleached kraft pulpmili effluent, experiments were designed to assess the effects of test temperature, acclimation tempera-ture, and fish species. Coho salmon (Oncorhynchus kisutch) conformed to a previously recognized test paradigm by showing progressively decreased oxygen utilization with increasing toxicant concentrations; however, rainbow trout (Salmo gairdneri) did not. In concentrations of effluent less than 1.5 LC50, rainbow trout used significantly more oxygen than control groups, while coho salmon used significantly less oxygen. The sensitivity of these responses was inced by test temperature and acclimation temperature. Results for coho confirmed that this species was most sensitive to effluent when tested at

ambient room temperature. Both species showed significantly decreased oxygen utilization in effluent concentrations greater than 1.5 LC50 irrespective of test temperature or acclimation temperature. The significance of these responses is discussed and the applicability of sealed-jar bioas-says or assessing the acute toxicity of pulpmill effluents is reviewed. (Katz) W77-12221

MERCURY LEVELS IN FRESHWATER FISH OF THE STATE OF SOUTH CAROLINA

South Carolina State Coll., Orangeburg. Dept. of Natural Sciences

A. K. Koli, W. R. Williams, E. B. McClary, E. L. Wright, and T. M. Burrell.

Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 1, p. 82-89, 1977. 2 fig, 2

Descriptors: "Metals, "Mercury, "South Carolina, "Freshwater fish, "Sampling, Fish physiology, Carp, Bass, Catfishes, Rivers, Lakes, Ponds, Seasonal, Path of pollutants, Water pollution, Bioindicators, Pikes

Identifiers: Bioaccumulation, Tissue analysis, Redbreast, Shad, Crappie, Mudfish, Savannah River, Edisto River, Lake Keowee, Lake Secession. Lake Murray.

Samples of fish from freshwater sources of rivers, lakes, and ponds all over South Carolina were collected during the summers of 1974 and 1975. The fish collected were bass, bluegill, redbreast, catfish, shad, carp, crappie, mudfish, and pike. Species for which fish of widely differing weights were analyzed, larger fish had higher mercur levels. Mercury levels exceeding the USDA guidelines were found in specific areas. Higher levels of mercury occurred in the highly vascularized blood tissues of liver and kidney than in muscle. Carnivorous and bottom-feeding fishes were the most reliable indicators of mercury pollu-

SYNCHRONOUS FLUORESCENCE SPECTROSCOPY AND ITS APPLICATION TO INDIGENOUS AND PETROLEUM-DERIVED HYDROCARBONS IN LACUSTRINE SEDI-

Washington Univ., Seattle. Dept. of Chemistry; and Washington Univ., Seattle. Dept. of Oceanog-

raphy. S. G. Wakeham. Environmental Science and Technology, Vol. 11, No. 3, p. 272-276, 1977. 4 fig, 30 ref.

Descriptors: *Analytical techniques, Organic com-pounds. *Oil, *Fuels, *Fluorescence, *Oil, pounds, *Oil, *Fuels, *Fluorescence, *Chromatography, *Spectorscopy, Lakes, Chemistry, Chemical reactions, Chemical proper-ties, Fluorometry, Oil spills, Water pollution ef-

feets, Washington.

Identifiers: *Synchronous fluorescence spec-Identifiers: *Synchronous fluorescence troscopy, Chemical characterization, Washington(Wash).

A comparison of conventional fluorescence emisspectra and spectra produced by synchronously scanning both excitation and emis sion monochromators was made on a series of standard oils to demonstrate the increased resolution achieved by the synchronous techn Greater information on the aromatic content of the oils was obtained by separating the aromatic hydrocarbon fractions by liquid-solid column chromatorgraphy prior to fluorescence analysis. Fluorescence spectroscopy, in particular the synchronous method, was used to characterize the indigenous and petroleum-derived aromatic hydrocarbons in sediments of lake Washington, Wash (Katz)

Group 5A-Identification Of Pollutants

FIELD STUDIES OF SHELL REGROWTH AS A BIOINDICATOR OF EASTERN OYSTER (CRASSOSTREA VIRGINICA GMELIN) RESPONSE TO 2,4-D BEE IN MARYLAND TIDEWATERS, Maryland Univ., Solomons. Chesapeake Biologi-

cal Lab.

C. K. Rawls.

Chesapeake Science, Vol 18, No 3, p 266-271, 1977. 2 fig, 1 tab, 3 ref.

Descriptors: *Crustaceans, *Oysters, Animal physiology, *Bioindicators, Organic compounds, *Chlorinated hydrocarbon pesticides, *Pesticides, Path of pollutants, Growth rates, Environmental effects, Bioassay, Invertebrates, Commercial shellfish, Maryland, Tidal waters. Identifiers: "Shell regrowth, "2-4-D BEE, "Eastern oyster, "Crassostrea virginica, Tissue

analysis.

New growth was filed from eastern oyster (Crassostrea virginica) shells and wire trays holding 25 oysters each were exposed to the butoxyethanol ester of 2,4-dichlorophenoxyacetic acid (2,4-D BEE) at rates of either 22,5, 33,75 or 67.5 kg ae (acid equavalent)/h (20, 30, or 60 lb ae/acre). Regenerated shell growth was measured to deter-mine the effect of herbicide application on the oyster. Two sites were used: a double-pond area with narrow inlet and outlet, and an open bay. Plant control was noted. Under the conditions of the study oyster shell regrowth or replacement did not reflect adverse reactions to the level of herbicide applied. It appeared that 2,4-D BEE in Mary-land probably can be used safely to clear oyster beds of eurasian watermilfoil (Myriophyllum specatum) prior to fall osyter harvest. (Katz) W77-12233

A 96-HOUR SEDIMENT BIOASSAY OF DU-LUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST OR-GANISMS,

Heidelberg Coll., Tiffin, Ohio. Dept. of Biology; and Heidelberg Coll., Tiffin, Ohio. River Studies

B. C. Prater, and M. A. Anderson.

Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 2, p 159-169, 1977. 2 fig, 6 tab. 5 ref.

Descriptors: *Sediments, Sampling, Water quali-ty, *Toxicity, *Chemistry, *Bioassay, *Chemical analysis, *Physiochemical properties, Soil analysis, Mayflies, Bioindication, Mortality, Inorganic compounds, Plankton, Phytoplankton, Fish, Daphnia, Minnows, Lake Superior, Ecosystems,

Minnesota, Pollutant identification.

Identifiers: Fathead minnows, Duluth(Minn),
Bioaccumulation, Hexagenia, Asellus, Pimephales.

Sediment bioassays were conducted on eight sediments collected from Duluth and Superior Harwere suspected to be heavily polluted, moderately polluted, and nonpolluted. A correlation was drawn between the percent mortality of biological test organisms and bulk chemistry data. (Katz) W77-12240 bors. The stations were chosen to reflect areas that

DISTRIBUTION OF N-PARRAFINS SELECTED MARINE BENTHIC ORGANISMS, Texas A and M Univ., College Station. Dept. of Chemistry.

C-S. Giam, H. S. Chan, and G. S. Neff. Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 1, p 37-43, 1976. 5 fig, 7

*Organic com-Descriptors: *Benthic fauna, pounds, *Invertebrates, Distribution, Animal physiology, Speciation, Metabolism, *Shrimp, Fish, Mollusks, Baseline studies, Gas chromatography, Analytical techniques. Identifiers: *Squid, *Parrafins, Bioaccumulation,

Tissue analysis

Gas chromatography was used to quantitate the hydrocarbons present in organisms (squid, shrimp, and fish) collected from various sites. All of the organisms had high concentrations of the C-15 and C-17 N-parrafins of of the C-31 compound or both. Shrimp and wenchmen samples appeared to exhibit the least intraspecies and seasonal variation relative to their distribution of n-parrafins. The rise of overall distribution in addition to the odd/even ratios of hydrocarbons for baseline monitoring of hydrocarbon content was recommended. (Klein) W77-12241

CHARACTERIZATION POLYCHLORINATED BIPHENYL DISTRIBU-TION IN THE MARINE ENVIRONMENT. Washington Univ., Seattle. Dept. of Oceanog-

raphy. R. N. Dexter, and S. P. Pavlou.

Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 477-482, 1976. 2 fig, 2

Descriptors: *Distribution patterns, *Analytical techniques, *Spectroscopy, *Chemical analysis, *Polychlorinated biphenyls, *Organic compounds, Laboratory tests, Research and development, Analysis, Chemistry, Technology, Aroclor, Water quality, Methodology, *Pollutant identification, Path of pollutants.

A spectral analysis technique was presented that was uniquely advantageous in describing environ-mental chlorobiphenyl distributions. It was based on easily determined empirical parameters, could be readily tailored to most laboratory systems, and could effectively remove an chlorobiphenyl quantitation. (Klein) ambiguities in W77-12242

ANALYSIS OF HEAVY METALS AND BACTERIA IN SEDIMENTS FROM DANISH LIG-NITE PITS

Copenhagen Univ. (Denmark). Inst. of Hygiene. E. Fjerdingstad, E. Fjerdinstad, and F. Popea. Archiv fur Hydrobiologie, Vol 77, No 2, p 226-253, 1976. 6 fig, 8 tab, 40 ref.

Descriptors: Metals, *Heavy metals, *Sediments, *Bacteria, *Lignite, Water pollution sources, Mining, Organic matter, Mine wastes, Mine drainage, cal properties, Hydrogen ion concentration, Iron thiobacillus ferroxidans. Productivity, Analytical techniques, Physiochemi-Identifiers: *Lignite pits, *Denmark.

Samples of sediment were drawn from some old, open lignite pits and investigated with a view to establishing the occurrence of trace elements. Iron constituted about 50% of the dry weight of these samples. Extensive investigations of the occurrence of acid thiobacilli were likewise made. With the only exception of T. ferro-oxidans, the species were determined on the basis of the pH-value after 28 days of incubation. There was found to be a great disparity in number as regards bacteria cultivated in sulfur medium and bacteria cultivated in thiosulfate medium. A reason for this might be that heavy metal sulfides were sparingly soluble in a sulfur medium whereas the complexes formed in the thiosulfate medium are more easily soluble. (Klein) W77-12250

5B. Sources Of Pollution

PARTITIONING OF POLYCYCLIC AROMATIC HYDROCARBONS BETWEEN DISSOLVED

AND PARTICULATE PHASES IN NATURAL

WATERS, Oak Ridge National Lab., Tenn. Environmental Sciences Div. S. E. Herbes.

Water Research, Vol. 11, (1977), p 493-496. 3 fig, 17 ref. LAG-D5-E681.

Descriptors: Environmental effects, *Water pollution effects, *Organic compounds, *Aromatic compounds, Adsorption, Food chains, Natural

Identifiers: Polycyclic aromatic hydrocarbons.

Polycyclic aromatic hydrocarbons (PAH) have often been assumed to exist entirely in particulate form in natural waters. The present research was intended to quantitate adsorption characteristics of a representative PAH compound onto organic particulate material and to identify critical adsorp-tion parameters. Anthracene was chosen as a model PAH compound. The results indicated that a significant fraction (0.15-0.65) of anthracene would be associated with detrital and living organic matter in natural waters containing moderate levels of suspended organic solids. Due to struc-tural similarities, other PAH compounds may be expected to partition in a similar manner and sub-stantial fractions of both dissolved and particulate PAH phases may thus be anticipated in natural . Rates of uptake and bioaccumulation of both forms must be examined to determine potential hazards of PAH throughout aquatic food chains and ultimately to terrestrial consumers, including man. (Chilton-ORNL)
W77-11504

THE ACCUMULATION OF MERCURY BY THE

THORNBACK RAY, RAJA CLAVATA L.,
Ministry of Agriculture, Fisheries and Food,
Lowestoft (England). Fisheries Radiobiological Lah

For primary bibliographic entry see Field 5C. W77-11507

THE ACCUMULATION OF MERCURY FROM FOOD BY THE PLAICE, PLEURONECTES PLATESSA L.,

Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

For primary bibliographic entry see Field 5C. W77-11508

HEAVY METALS IN WATER, SEDIMENTS,

HEAVY MEIALS IN WATER, SEDIMENTS, AND CHIRONOMIDS, TECHRAD, Inc., Oklahoma City, Okla. H. Namminga, and J. Wilholman, Oklahoma Journal Water Pollution Control Federation, Vol. 49, No. 7, July 1977, p 1725-1731. 3 tab, 34 ref.

Descriptors: Environmental effects, *Water pollution sources, *Heavy metals, *Sediments, *Diptera, Copper, Chromium, Lead, Zinc, *Oklahoma. Identifiers: *Skeleton Creek(Okla).

Longitudinal variation in the concentrations of copper, chromium, lead, and zinc in water, sediments, and chronimids in Skeleton Creek, Oklahoma were measured and concentrations were compared in cool and warm seasons. Tem-perature ranged from 1 to 12 C on the two winter sampling days and from 25 to 29 C on the summer days. Mean concentrations for copper, chromium and zinc in water were 4.1, 1.1, and 9.1 microg/l, respectively, with concentrations being generally higher in February than in August. Concentrations of copper, chromium, lead, and zinc in sediments were 1.8, 5.2, 3.5, and 9.2 microgl, respectively, with concentrations being generally higher in summer than in winter. Copper, chromium, lead and zinc concentrations in chironimids were 1.91, 2.96, 1.32, and 57.05, respectively. (Chilton-Control of the control W77-11510

MERCURY IN BOTTOM SEDIMENTS OF RIET-

VLEI RESERVOIR, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Chemistry. E. M. Veres, and R. A. Hasty.

outh African Journal of Science, Vol 72, March 1976, p 86-87. 1 fig, 1 tab, 11 ref.

Descriptors: *Water pollution sources, Industrial wastes, Farm wastes, *Mercury, Sediments, Reservoirs, Africa. Identifiers: *Rietvlei Reservoir(South Africa).

Core samples of sediments were taken from Riet-vlei Reservoir at four stations. Results from these samples showed mercury concentrations ranging from 0.1 to 0.5 microg/g of dry sediment. Higher concentrations were found in the main channel flowing from the catchment area. Generally, there was little variation of concentration with depth of sediment, which indicates a constant level of mercury flowing into the impoundment over the period of build-up of the bottom sediments. This pattern is in contrast to that found in sediments from other industrial or urban areas. (Chilton-ORNL) W77-11512

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COM-

POUNDS, (IN JAPANESE),
Tokai-Kinki National Agricultural Experiment

Station, Tsu (Japan). Y. Tokunaga, Y. Honjho, and J. Asano. Bull Tokai-Kinki Natl Agric Exp Stn. 24, p 151-180. 1972.

Descriptors: *Nitrogen compounds, *Irrigation water, *Rice, Water reuse, Water pollution sources, *Plant growth.

There were 2 effects, the direct effect of polluted water-N (N contained in polluted water) and the indirect effect of polluted soil-N (N mineralized from soil organic N which was accumulated by irrigation with polluted water). These 2 effects had different actions on plant growth. The amount of NH4-N mineralized in polluted soil by incubation under the waterlogged condition at 30 C was eater than in non-pollutd soil and the ratio of NH4-N mineralized at 20 C to NH4-N mineralized at 30 C in polluted soil under the same condition was higher than in non-polluted soil. The amount was higher than in non-pointed son. The amount of NH4-N in paddy soil was influenced mainly by fertilizer-N (N given as basal fertilizer) then by polluted soil-N and lastly by polluted water-N. In relation to growth stage the degree of the effects was fertilizer-N > polluted soil-N was rerunzer-N > polluted soil-N > polluted soil-N > fertilizer-N > polluted water-N at and after the period of young panicle formation. Fertilizer-N increased plant height and number of tillers in the early growth stage, polluted soil-N increased plant height, number of tillers and culm length in plant height, number of uners and cum tong the middle stage and polluted water-N increa culm length and lowered ripening qualities in the late stage. Polluted soil-N and polluted water-N inand stage. Pointied soil-N and pointied water-N in-creased the growth and N concentration of the plant. If the N supply was excessive the yield was reduced, the amount of polluted water-N was equivalent to 5 kg per 10a as basal fertilizer, that of polluted soil-N equivalent to 10 kg per 10a (1969), and that of polluted soil-N equivalent to above 5 kg per 10a (1970). Analysis of variance of absorbed amounts of N showed that the amount of polluted water-N was about 5 kg and that of polluted soil-N was 8 or 9 kg per 10a. N-Accumulation by non-polluted soil-free 2 are period of instruction with boll luted soil after a 2 yr period of irrigation with pol-luted water was not detected from results of incubation, fractionation of organic N of soil and growth and yield of rice plant. A small cleansing of polluted soil by a 2 yr period of irrigation with non-polluted water was indicated by the results of air drying effect and fractionation of organic N of soil. The soil kept the nature of polluted soil, high NH4-N mineralization, much total N and much

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nondistillable-acid soluble N.-Copyright 1974, Biological Abstracts, Inc. W77-11515

SOIL AERATION, NITRATE REDUCTION AND FLOODING TOLERANCE IN

Seville Univ. (Spain). Dept. of Ecology. For primary bibliographic entry see Field 3C. W77-11517

DISTRIBUTION OF CADMIUM, ZINC AND COPPER IN THE MUSSEL MYTILUS EDULIS. OF CADMIUM-BINDING
SIMILAR TO EXISTENCE PROTEINS LOTHIONEINS,

Liege Univ. (Belgium). Laboratoire de Biologie Generale; and Liege Univ. (Belgium). Laboratoire

d'Oceanologie.
For primary bibliographic entry see Field 5C.
W77-11519

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND GER-MAN BIGHT, (IN GERMAN), Institut fuer Meeresforschung, Bremerhaven

(West Germany).
For primary bibliographic entry see Field 5A.
W77-11520

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE, Democritus Nuclear Research Center, Athens (Greece). Chemistry Dept.

For primary bibliographic entry see Field 5C. W77-11521

THE DEPTH OF PENETRATION WITH WATER OF THE PESTICIDE BHC IN THE PRESENCE OF SULFANOL INTO THE GROUND, (IN RUS-

STAN), Nauchno-Issledovatelskii Institut Epidemiologii, Mikriobiologii i Gigieny, Vilnius (USSR). E. M. Shtarkas.

GIg Sanit. 37(2), p 106-108, 1972.

Descriptors: *Pesticides, Depth, Spatial distribu-tion, *Adsorption, Soils, *Soil analysis, *Path of pollutants, Water pollution. Identifiers: *BHC, Granulometric composi-

tion(Soils), *Sulfanol.

An experimental model consisting of a filtration column 2.67 cm high with a diameter of 0.4 m was constructed. Stopcocks were arranged at a vertical distance of 50 cm. The column was filled with soil distance of 50 cm. The column was fulled with sour with coarse (2 and 20 mg/l) and sulfanol (5 mg/l) were added to pure aqueduct water. Soil was contaminated 4 times with BHC and sulfanol (or their binary mixture). BHC was determined by thin-layer chromatography; sulfanol was determined by a modification of the Longwell and Maniece method. Water samples of BHC and (242) of sulfanol (133) were studied. Soil was impregnated with BHC at varying concentrations with or with BHC at varying concentrations with or without sulfanol and contaminated to various depths in 4 steps. The depth of penetration of BHC depends on the granulometric composition of the soil; the contaminating does of BHC in the original water affects its concentration in water filtering through the experimental unit. In coarse soil, BHC with water in the presence of sulfanol penetrates deeper at higher concentration than without sulfanol. In finer soil, BHC with water in the presence of sulfanol penetrates mainly at lower concentrations than without sulfanol, which is apconcentrations trian without sulfanol, which is apparently explained by a change in the adsorptive capacity of the particles as a result of foaming. BHC is not stably bound to soil particles and may occasionally be washed off with water in deep soil.—Copyright 1974, Biological Abstracts, Inc. W77-11523

INTERFACIAL REACTIONS AND THE FATE OF HEAVY METALS IN SOIL-WATER SYSTEMS, Delaware Univ., Newark. C. P. Huang, H. A. Elliott, and R. M. Ashmead.

Journal Water Pollution Control Federation, Vol 49, No 5, May 1977, p 745-756. 8 fig, 1 tab, 32 ref.

Descriptors: *Water pollution sources, *Heavy metals, Interfaces, *Earth-water interfaces, Chemistry, Adsorption, Chemical precipitation, Soil chemistry, Solubility.

The processes and factors that govern the fate of heavy metals in the soil-water system are identified as dissolution-precipitation and adsorption. The congruent and incongruent solubility of oxides, hydroxides, sulfates, sulfides, and car-bonates of heavy metals contributes to the chemical constituents of soil-water. The process is influenced by pH, redox potential, the amount of carbonate and sulfur present and the presence of organic substances. The formation of metal-chelates or metal complexes can render metal solids more soluble. Microorganisms, whose metabolic activities tend to modify the redox potential and contribute organic acids can influence the solubili-ty of metal solids. Interfacial association between heavy metals and soil minerals is considered the most important process in regulating the concentration of heavy metals in the soil-water environment. Copper and zinc are more removable than lead and cadmium. When the solid surfaces are very positively charged, positive lead and cadmium ions are expelled away from the interface and result in an excess of metal ions in the bulk phase of the soil-water system. (Chilton-ORNL) W77-11524

CONTENT OF PLUTONIUM, THORIUM AND PROTACTINIUM IN SEA WATER AND RECENT CORAL IN THE NORTH PACIFIC, Kanazawa Univ. (Japan). Radiochemistry Lab. For primary bibliographic entry see Field 5A.

DISTRIBUTION OF PLUTONIUM-237 IN A LIT-TORAL FRESHWATER MICROCOSM,

Oak Ridge National Lab., Tenn. Environmental Sciences Div. J. R. Trabalka, and L. D. Eyman.

Health Physics, Vol 31, October 1976, p 390-393. 1 tab. 13 ref.

Descriptors: *Water pollution effects, Environ-mental effects, *Distribution, *Plutonium, Microenvironment, *Radioisotopes, *Path of pol-

Water in a year-old aquatic microcosm was spiked with 11 microCi of plutonium-237 nitrate. The initial water concentration (at 30 min after spike administration) was 1590 plus or minus dpm/g. A materials balance for the microcosm at 90 days provided the following estimates: 0.001% in the water, 0.04% in biota, and over 99.9% in sediments. It was concluded that the microcosm appears to be a highly useful tool in ecological studies of highly toxic material such as plutonium. (Chilton-ORNL) W77-11530

CHARACTERISTICS POULTRY. PROCESSING EFFLUENT, Rockingham Poultry Market Coop., Inc., Broad-

way, Va. S. P. Singh, R. Lewis Wesley, and E. A. Budd. Poult Sci. 52(4), p 1478-1481, 1973.

Descriptors: *Industrial wastes, *Effluents, Dissolved oxygen, Suspended solids, Hydrogen ion concentration, *Biochemical oxygen demand, Poultry, *Waste water treatment.

Identifiers: Effluent, *Poultry processing wastes.

Group 5B-Sources Of Pollution

Raw effluents from 4 broiler processing plants were analyzed for BOD5 (biochemical oxygen demand), suspended solids, pH, and dissolved O2.
Analytical procedures were conducted in a central independent laboratory. Variability was greatest in dissolved O2 and least in pH. A variety of factors influence the composition of raw effluents from broiler processing plants. This information should help in designing waste treatment systems for the processing industry.—Copyright 1974, Biological Abstracts, Inc. W77-11531

DISTRIBUTION OF CADMIUM AND LEAD IN A STREAM ECOSYSTEM.

Bradley Univ., Feoria, Ill. Dept. of Biology. M. D. Enk, and B. J. Mathis.

Hydrobiologia, Vol 52, No 2-3, 1977, p 153-158. 3 fig, 2 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution sources, Lead, Cadmium, Streams, Fish, Insects, Snails, Sediments, *Path of pollutants,

Fish, insect, snail, water and sediment samples were analyzed for lead and cadmium. Cadmium was present in all components analyzed. Its con-centration in water was less than 0.02 ppm. Cadmium concentration was highest in aquatic insects and was present in similar amounts in fish and ponents analyzed with a water concentration of less than 0.5 page. Concentration sediments. Lead was also present in all comess than 0.5 ppm. Concentrations of lead were higher in snails than in other components, similar in sediments and aquatic insects but higher than in fish. Concentrations of both lead and cadmium generally increased from water to fish to sediments to aquatic invertebrates. (Chilton-ORNL)

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY,

Bath Univ. (England).
For primary bibliographic entry see Field 5C. W77-11537

ALUMINUM-26 IN DEEP-SEA SEDIMENT, Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioac-

J. L. Reyss, Y. Yokoyama, and S. Tanaka. Science, Vol 193, September 1976, p 1119-1121. 2 tab, 12 ref.

Descriptors: Environmental effects, *Sediments, *Pacific Ocean, *Radioisotopes, *Aluminum, *Pacific Ocean, *Radioisotopes, Radioactivity, *Path of pollutants. Identifiers: Cosmic dusts.

A126 activity in a core sample from the North Pacific was measured. The samples were A1203 extracted from a red clay core from a depth of 5439 m. The activity was found to be 0.081 plus or minus 0.046 disintegration/minute/kilogram of dry sediment. This measurement corresponds to a A126/Be10 ratio of 0.018 plus or minus 0.011 which is in good agreement with that measured in Greenland ice. It was concluded that since the observed ratios are in agreement with predicted ratio of 0.013 plus or minus 0.006 for the production by cosmic rays in the atmosphere, the postulated high influx of A126 with cosmic dust should be reconsidered. The contribution of cosmic dust bearing A126 would appear to be small in comparison with the production of this nuclide in the atmosphere. (Chilton-ORNL) W77-11538

RADIOISOTOPE TECHNIQUES IN DELINEATION OF THE ENVIRONMENTAL BEHAVIOR OF CADMIUM.

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

R. I. Van Hook, Jr., B. G. Blaylock, E. A R. I. van 1908, Jr., B. G. Blaylock, E. A. Bondietti, C. W. Francis, and J. W. Huckabee. Environmental Quality and Safety, Global Aspects of Chemistry, Toxicology and Technology as Applied to the Environment, Vol 5, 1976, p 167-182. 6 fig, 7 tab, 28 ref.

Descriptors: Environmental effects, Behavior, Analytical techniques, *Cadmium. *Radioisotopes, Aquatic environment, Distribu-tion, Sediments, Soils, Vegetation, Food chains,

Tracer techniques using Cd109 to provide informa-tion on biogeochemical cycling and distribution of cadmium in the environment are discussed. Results of experiments indicated that in lake and river sediments the clay minerals adsorb Cd (-2) with increasing strength as pH is increased. Plant uptake studies indicated that the cadmium-soil reaction products are influenced by pH, chemical form of the element, and the presence of other ions. Plant distribution studies showed cadmium to be most available to animals whose food base was litter or detritus. Stream tagging experiments demonstrated cadmium to be accumulated by animals to a lesser extent than methylmercury. In land-water studies, the majority of the cadmium added via atmospheric input was found to be tied-up in the soil while that going into aquatic systems accumulated in sediments. (Chilton-ORNL) W77-11541

LET'S TALK RUBBISH PART 3: LITTER, P. B. Publico

Municipal Engineer, Vol. 7, No. 2, p 67-71, 1976.

Descriptors: *Waste disposal, *Litter, *Municipal wastes, Concrete pipes, Education, Attitudes, Cleaning, Environmental effects, *Solid wastes. Identifiers: South Africa

The extent of littering and possible preventive measures are discussed by the author. Examples of anti-litter campaigns, fines, publicity and edu-cation are presented. The author concludes that most of these measures have only a short-term effect, and that the solution to the litter problem lies in the provision of comprehensive waste collection services, and the positive anti-litter conditioning and education of children and adults, by participation in publicized clean-up projects, poster com-petitions, film shows and public awareness projects. (See also W77-10381) (So African Water Info Center) W77-11545

EPIDEMICS OF WEST NILE AND SINDBIS VIRUSES IN SOUTH AFRICA WITH CULEX (CULEX) UNIVITTATUS THEOBALD AS VEC-

Department of Health, Johannesburg (South Africa). Arbovirus Research Unit. For primary bibliographic entry see Field 5C. W77-11547

ORGANIC MATTER AND PARATHION DEGRADATION IN FLOODED SOIL Central Rice Research Inst., Cr. rack (India). N. Sethunathan. Soil Biol Biochem. 5(5), p 641-644, 1973.

Descriptors: *Organic matter, Flooding, Soils, *Hydrolysis, *Chemical degradation, Insecticides, Pesticides, Biodegradation.

Identifiers: *Parathion degradation, Rice straw.

The effect of rice straw on parathion degradation in a flooded alluvial soil was investigated. In soils inoculated with an enrichment culture which exhibited an exceptionally high ability to hydrolyze parathion, rice straw amendments inhibited parathion hydrolysis to p-nitrophenol and diethyl thiophosphoric acid. On the other hand, in uninoculated soils, rice straw enhanced the degradation of parathion via nitro reduction. During the enhanced breakdown of parathion in uninoculated soils amended with rice straw, aminoparathion and an unidentified metabolite evidently possessing a P=S bond were detected. Thus, the influence of organic matter on the per-sistence of parathion in flooded soil is governed by the metabolic pathway involved in the degrada-tion.—Copyright 1974, Biological Abstracts, Inc. W77-11561

MATHEMATICAL MODELLING OF THE MINERALIZATION OF RIVER SYSTEMS, National Inst. for Water Research, Pretoria (South

A. H. Gorgens. Water SA, Vol. 2, No. 1, p 13-19, 1976.

Descriptors: *Mathematical models, River systems, Hydrology, Hydrochemistry, Future planning, Mineralogy. Identifiers: South Africa.

During 1974, the National Institute for Water Research of South Africa's Council for Scientific and Industrial Research initiated work on the development of mathematical models of the hydrology and mineralization of two South African multi-catchment river systems. These models mathematically synthesize the hydrology of the systems as influenced by human activities, and superimpose the characteristic hydrochemistry of the various mineral source areas in the catchments on it. Use of the models in the evaluation of the beneficial or detrimental effects of possible structural and operational remedial measures on the long-term mineralization is planned, the aim being delivery of water of acceptable chemical quality to future users in the areas. (So Africa Water Info Center) W77-11570

METAL ENRICHMENT OF SEDIMENTS IN IN-LAND WATERS - THE JUKSKEI AND HEN-NOPS RIVER DRAINAGE SYSTEMS.

Pretoria Univ. (South Africa). Dept. of Chemistry. G. T. Wittmann, and U. Forstner. Water SA., Vol. 2, No. 2, p 67-72, 1976. 2 fig, 4

Descriptors: *Heavy metals, *Sediments, Distribution, Mercury, Lead, Cadmium, Zinc, Drainage basins. Identifiers: Hartbeespoort Dam, Rietvlei Dam, Jukskei River, Hennops River, Modderspruit.

A preliminary investigation has been conducted to establish possible sources of heavy metal discharges into the Crocodile River, resulting in an enrichment of sediments from the south-eastern zone of the Hartbeespoort Dam with mercury, lead, cadmium and zinc. Despite heavy rainfall and ensuing floods which preceded the period of sediment sampling, significant heavy metal en-richment of the pelitic sediment fraction < 2microgram from the feeder streams, has been established: The Jukskei River fed by the Modderspruit, with drainage from a chemical industrial area, chiefly contributes toward the elevated levels of lead, cadmium and zinc found in the Crocodile River estuary; by contrast, the Hennops River, draining the highly industrialized Isando-kempton Park area, transports high concentra-tions of mercury. (So African Water Info Center)

HYDROLOGIC RESPONSE AND NUTRIENT CONCENTRATIONS FOLLOWING SPRING BURNS IN AN OAK-HICKORY FOREST, Forest Service (USDA), Grand Rapids, Minn. Northern Conifers Lab. For primary bibliographic entry see Field 4C. W77-11613

CYANIDE MOBILITY IN SOILS.

Arizona Univ., Tucson. Dept. of Soils, Water and

Master of Science thesis, 1976. 34 p, 7 fig, 5 tab, 23

Descriptors: *Chemical wastes, *Water pollution, *Water pollution sources, *Groundwater movements, *Toxins, Water quality, Soil properties, Soil water movement, Infiltration, Groundwater, Soil contamination, Soils, Leaching, Chemicals, Aquifers, Clays, Recharge, Groundwater recharge. Identifiers: *Cyanide.

The frequency of groundwater pollution by hazardous toxic elements is steadily increasing in the United States. With existing pollution regula-tion forcing an increased volume of toxic chemical waste to the land for ultimate disposal, many aquifers in various regions of the United States may be in danger of serious water quality degradaif soils are not effective in preventing hazardous waste from migrating downward to the groundwater table when they are recharged by rainfall infiltration. Three solutions of cyanide were each leached through five soils of varying physical and chemical properties to evaluate hich soil characteristics govern the movement of the various forms in soils. The results are presented. Four recommendations for preventing cyanide contamination of groundwater systems:

(1) maintenance of the cyanide plant in good condition to avoid or reduce spills or leakage; (2) establishment of a good treatment system; (3) any cyanide remaining after treatment can be effec-tively filtered by the soil; results from experiments show that soil should be deep, have a clay texture high in iron oxide and kaolinitic type clay with low pH., and (4) the soil should be innoculated, if possible, by cyanide degrading organisms. (Jamail-W77-11619

THE EFFECT OF SALINITY OF QARUN LAKE ON THE ADJACENT SOIL, Ministry of Agriculture, Cairo (Egypt). Soils and

Water Research Inst. For primary bibliographic entry see Field 2H. W77-11625

DISTRIBUTION OF NITRILYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS.

rimary bibliographic entry see Field 5C. For primar W77-11651

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A PRELIMINARY OCEANOGRAPHIC SURVEY OF THE DAMARISCOTTA RIVER ESTUARY,

LINCOLN COUNTY, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. R. I. McAlice

ine Sea Grant Technical Report No. TR-13-77, 1977. Also Ira C. Darling Center contribution No. 54. 35p, 16 fig, 9 tab, 32 ref, 8 infolds. SG-04-3-158-

Descriptors: *Maine, Surveys, *Estuaries, *Water quality, *Sediments, *Oceanography.
Identifiers: Damariscotta River estuary(Maine).

The Damariscotta River estuary is a narrow embayment which receives a limited amount of fresh water. The estuarine portion has a MLW volume of 123.4 x 106 m3, a tidal volume of 56.2 x 106 m3, and a mean summer flushing time of 4.5 weeks. The estuary is stratified near its head but approaches a well mixed condition further seaward. Seawater moving upstream at depth is important in the circulation. Surficial sediments are for the most part poorly to extremely poorly sorted, clayey to sandy silts. Rocky bottoms and lag deposits occur in high energy areas. Sediments are

apparently modern extuarine deposits of local origin and reworked glacial material. Except for some bacterial pollution, sewage from Damariscotta and Newcastle has no noticable effect on water quality. Seasonal and spatial differences in temperature, salinity, dissolved oxygen and inorganic nutrients are discussed. (NOAA) W77-11657

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN. National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Marine Ecosystems Analysis

Program Office.

Program Office.
NOAA, ERL, Marine Ecosystems Analysis Program Office and Science Applications, Inc., Report, April 15, 1977. 227 p, 6 fig, 7 tab, 123 ref, append. NOAA Contract to SAI 03-7-022-35105.

Descriptors: *Ecosystems, *Estuaries, *Water pollution, *Management, Project planning, Project management, Waste disposal. Identifiers: *New York Bight, Ocean dumping, *Outer Continental Shelf, Environmental assess-

The New York Bight was selected for an initial project because of the significance and urgency of its environmental problems. The Bight is the recipient of the nation's largest ocean dumping operation. The MESA New York Bight Project Development Plan presented has been jointly prepared by the MESA Program Office and the New York Bight Project Staff and represents the overall plan for project implementation. The plan describes a systematic approach to achieving specifically identified goals and objectives that have been delegated to the Department of Com-merce for protection of the marine environment. The overall goals of the Project are to develop a comprehensive understanding of the processes and interrelationships of the ecosystem and to determine the fate and effects of pollutants and other man-related stresses on the New York Bight. The Project priorities focus on the three significant contaminant sources in the Bight Apex: Estuarine inputs and coastal outfalls, Dredge materials, and Sewage sludge. The project is guided even more specifically by the requirements of user agencies in planning for future actions such as monitoring of the Bight, oil and gas development, offshore nuclear power generation, and the development of alternatives to existing waste disposal strategies. (NOAA) W77-11661

LIMNOLOGICAL STUDIES OF THE ONO RESERVOIR: THIRD REPORT, For primary bibliographic entry see Field 5C. W77-11713

TRANSVERSE-GRID WATER QUALITY ANALYSES OVER THE SZOB-BUDAPEST DANUBE SECTION KERESZTMETSZETHALOS VIZMINO VIZSGALATOK A DUNA SZOB-BUDAPEST KOZOTTI SZAKASZAN), Kozepdunavolgyi Vizugyi Igazgatosag, Budapest

(Hungary). For primary bibliographic entry see Field 5A. W77-11731

BACTERIOLOGICAL ANALYSES OVER THE RAJKA-BUDAPEST DANUBE SECTION (BAKTERIOLOGIAI VIZSGALATOK A DUNA RAJKA-BUDAPEST KOZOTTI SZAKASZAN), National Inst. of Public Health, Budapest For primary bibliographic entry see Field 5A. W77-11732

BEHAVIOR OF BENZIDINE AND OTHER ARO-MATIC AMINES IN AEROBIC WASTEWATER TREATMENT,
Los Angeles County Sanitation District, Whittier,

Calif.

R. Baird, L. Carmona, and R. L. Jenkins. Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1609-1615, July, 1977. 4 fig, 4 tab, 17

Descriptors: *Organic wastes, *Toxicity, *Activated sludge, *Aerobic treatment, *Human pathology, Public health, Water pollution effects, Organic compounds, Byproducts, Water Pollution Control Federation, Waste water treatment. Identifiers: Amines, Benzidine, Aromatic amines, Warburg respirometry.

Benzidine, 1-napthylamine, and other aromatic amines have been indicated as carcinogenic, causing bladder cancer in humans occupationally exposed to them. These compounds can be contained in industrial waste waters discharged into municipal sewers. A review of the various methods to isolate and identify carcinogens from surface and waste waters is presented. An investigation was undertaken to study the effects of benzidine on activated sludge respiration, establish relative toxicities for amines, determine the effects of activated sludge treatment on amines, examine possible criteria for biological attack, and define refractory metabolic intermediates. Methods' used included Warburg respirometry, gas-liquid chromatog-raphy, mass-spectrometry, colorimetric analysis, and computer analysis. Results indicated that carcinogenic amines were not immune to biologic treatment, as suggested by previous studies, but did appear to be transformed to a degree. It was suggested that the metabolic intermediates might be responsible for the toxicity and carcinogenicity. None of the suspected carcinogenic bio-oxidation products of benzidine were observed to survive the activated sludge process. In light of the results, it was suggested that sludge be analyzed for the presence of metabolic intermediates as well as for the amines themselves. (Schulz-FIRL)

PROBLEMS RELATED TO WATER QUALITY OVER THE DANUBE SECTION BETWEEN RAJKA AND ESZTERGOM (A RAJKA-ESZTER-GOM KOZOTTI DUNA-SZAKASZ MINOSEGI PROBLEMAI), Vizugyi Eszakdunantuli Igazgatosag,

Gyor(Hungary).
M. Abraham, and N. Varday.
Hidrologiai Kozlony, Vol. 52, No. 2, p 60-64,
February, 1977. 6 fig, 1 ref.

Descriptors: *Water quality, *Chemical oxygen demand, *Oxygen demand, Streamflow, *Rivers organic loading, Waste assimilative capacity, Effluents, Waste water disposal, Waste water treat-

Identifiers: Hungary, Danube River.

The North Hungary District Water Authority has examined water quality for a section of the Danube between Rajka and Esztergom for the past 15 years. Records showed that the mineral content of the Danube water was related to the rate of streamflow alone, while the organic pollutant load was also related to temperature. A deteriorating trend in water quality as indicated by CODstreamflow measurements was attributed to increasing effluent discharges into the Danube by area industries and communities. It was found that 02 consumption was not uniform throughout the river's cross-section but was a function of depth and prevailing current. Water quality was observed to improve from Rajka downstream at Komarom, but increased effluent discharges were observed below that point. (Schulz-FIRL) W77-11738

Group 5B-Sources Of Pollution

STANDING COMMITTEE ON THE DISPOSAL OF SEWAGE SLUDGE.
For primary bibliographic entry see Field 5E.
W77-11740

SECONDARY SEWAGE TREATMENT VERSUS OCEAN OUTFALLS: AN ASSESSMENT, Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.

For primary bibliographic entry see Field 5E. W77-11766

OBSERVATION ON THE HYDROLOGY OF THE RIVER KHAM,

Marathwada Univ., Aurangabad (India). Dept. of

Zoology. S. S. Bapat, and V. R. Madlapure. Marathwada Univ J Sci Sect B Biol Sci. 11(4), p

Descriptors: *Rivers, Asia, Chlorides, Calcium, Temperature, Hydrogen ion concentration, Hydrology, Phosphates, Dissolved oxygen, Hydrology, Phe *Water pollution. Identifiers: *River Kham(India).

The hydrology of the River Kham (India) is discussed. The hydrological conditions such as the temperature, pH, dissolved O2, inorganic phosphates, Ca and chlorides were studied in the mo. April and May, 1972 .-- Copyright 1974, Biological Abstracts, Inc. W77-11769

IMPACT OF WATER RESOURCES ON VEC-TOR-BORNE DISEASES,

Center for Disease Control, Fort Collins, Colo.

Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WR2, p 177-183, November 1976. 14 ref.

Descriptors: *Water resources development, *Diseases, *Public health, *Vectors(Biological), Mosquitoes, Effects, Human diseases. Identifiers: *Encephalitis.

Vector-borne diseases are transmitted to wildlife, domestic animals, and human by insects and other types of arthropods. Mosquitoes are the principal vectors associated with most types of water and related land resources developments in the United States. The nature of these problems is reviewed. The need to understand the ecologic conditions involved in vector production and to incorporate vector prevention designs and techniques in pro-ject proposals and plans is stressed. (Bell-Cornell) W77-1174

MATHEMATICAL MODELING OF TRANS-PORT PROCESSES IN AQUATIC SYSTEMS, Battelle Pacific Northwest Labs., Richland, Wash.

D. S. Trent.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as CONF-750413-1, Price codes: A20 in paper copy, A01 in microfiche. Paper for Presentation at the Topical Meeting on Computation Methods in Nuclear Engineering, American Nuclear Society, Charleston, South Carolina, April 1975. 47 p, 7 fig, 1 tab, 107

Descriptors: *Aquatic environment, *Systems analysis, *Numerical analysis, *Hydrodynamics, *Simulation analysis, *Flow, *Mathematical models, Water pollution, Pressure, Seasonal, Shear, Currents, Stagnant water, Behavior, Tur-

Suear, Currents, Stagmant water, Benavior, Tur-bulent flow, Diffusion, Equations. Identifiers: *Transport processes, Partial dif-ferential equations, Ports, Vorticity transport, Similarity models, Lumped parameter models, In-stantaneous distribution, Continuous release, Plume behavior, Receiving water.

Our aquatic environment is likely to be burdened with industrial and municipal waste discharges as long as man inhabits the earth. But waste arges need not always create adverse conditions; in fact, in some cases discharges can be beneficial. We must have resources available for predicting the ultimate physical fate of the discharged constituents, so that transitory and chronic environmental impacts can be assessed. Physical transport analysis in aquatic systems is one such predictive tool. This report considers numerous aspects of simulating aquatic systems. After briefly discussing the sources of aquatic pollutants and the principles of modeling in aquatic systems, the report deals in detail with partial differential equations which govern hydrodynamics and transport; considered are incompressible tur-bulent flow and vorticity transport. Next, models and approximations are presented. Discussed are: lumped parameter models, considering instantaneous distribution, continuous release, and shear currents; similarity models, including plume behavior, hydrodynamic regimes, and similarity analysis applied to a single round port in stagnant receiving water; and numerical simulation models. (Bell-Cornell) W77-11786

BUDGET OF SELECTEINUTRIENTS FOR TWO SELECTED MINERAL WATERSHED ECOSYSTEMS IN THE SOUTHEASTERN PIED-MONT,

Univ., Athens. Inst. of Natural Georgia

J. E. Krebs, and F. B. Golley. Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 286, Price codes: A07 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 03-77, June, 1977. 124 p. 59 tab, 13 fig, 47 ref, append. OWRT B-108-GA(1), 14-31-0001-5067.

Descriptors: Pollutant identification, Water pollution, Calcium, Cadmium, Cobalt, Copper, Chromium, Iron, Potassium, Phosphorus, Mag-nesium, Manganese, Sodium, Lead, Zinc, US, *Ecosystems. *Watersheds(Basins), Nutrients, *Nutrient requirements, Aluminum, Input-output analysis, Identifiers: *Nutrient budget, Silicon.

Input-output budgets of aluminum, calcium, cadmium, cobalt, chromium, copper, iron, potassium, magnesium, manganese, sodium, phosphorus, lead, silicon, and zinc were calculated for two watershed ecosystems in the southeastern Piedmont-a mixed pine-hardwood forest and pasture. Measurements were made during a 15month period of inputs in rainwater to both ecosystems and also inputs in other feed to the pasture. Outputs measured from both ecosystems included those dissolved and suspended in streamwater and those carried in the bedload sediment. Additionally, there was an output of calves from the pasture. Analyses were made on an inductively-coupled argon plasma emission spectrograph. Both watershed ecosystems were accumulating cadmium, chromium, copper, potassium, phosphorus, lead, and zinc. Both had a net loss of aluminum, calcium, cobalt, manganese, sodium, and silicon. Magnesium showed a net loss from the forest but was accumulated by the pasture.

PREDICTING THE RATE OF WARMING OF RIVERS BELOW HYDROELECTRIC INSTAL-

Georgia Dept. of Natural Resources, Atlanta. En-vironmental Protection Div.

R. W. Troxler, and E. L. Thackston.

Journal Water Pollution Control Federation, Vol 49, No 8, p 1902-1912, August 1977. 6 fig, 4 tab, 6 Descriptors: *Path of pollutants, *Hydroelectric plants, Rivers, Reservoirs, *Water temperature, *Model studies, Mathematical models, On-site investigations, Hypolimnion, *Energy budget, Radiation, Solar radiation, Heat transfer, Temperature of the state of the sta perature, Dye releases, Dye concentration, Meteorological data, Fog, Winds, Air tempera-ture, *Thermal pollution, *Forecasting. Identifiers: *River warming, Cold water releases.

The purpose of the reported study was to con-struct and to verify an energy budget model for the accurate prediction of temperature changes in flowing rivers, based solely on the approximate geometry of the river and on data normally taken at first-order weather stations. The warming of cold water released from the hypolimnion of stratified reservoirs through hydroelectric plants was studied. By collecting and analyzing various atmospheric conditions at nearby weather stations, results showed that generally good agree-ment between observed and predicted temperatures can be realized if appropriate adjustments to the Weather Bureau data can be made. (Sims-ISWS) W77-11819

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALI-TY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW, Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.

For primary bibliographic entry see Field 5C. W77-11833

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER, Helsink Univ. of Technology, Otaniemi (Finland).

Radio Lab. For primary bibliographic entry see Field 5A. W77-11891

LANDSAT OBSERVATIONS OF OCEAN DUMP

PLUME MOVEMENT AND DISPERSION, Delaware Univ., Newark. Coll. of Marine Studies. V. Klemas, G. Davis, and R. Henry. Available from the National Technical Inform

Available from the National Technical Information Service, Springfield, VA 22161 as N76-29662, Price codes: A02 in paper copy, A01 in microfiche. Report on Significant Results prepared for Goddard Space Flight Center, July, 26, 1976. 4 p. NAS5-20983.

Descriptors: *Waste disposal, *Environmental effects, *Baseline studies, *Circulation, Delaware, *Path of pollutants.

Identifiers: *Outer Continental Shelf, *Ocean dumping, Resources management, *Cape Henlopen(Del), Coastal zone, Titanium dioxide.

Eighteen LANDSAT images were analyzed to study the dispersion and movement of ocean dump plumes thirty-eight miles southeast of Cape Henplumes thirty-eight miles southeast of Cape Hen-lopen, Delaware, at the disposal site for waste discharged from a plant producing titanium diox-ide. The discharge, which is a greenish-brown liquid containing up to 10% acidity and 4% iron chloride salts, is discharged several times per month. The following preliminary results were ob-tained: the frequency of the dynamics made it tained: the frequency of the dumping made it possible for the LANDSAT satellite to image the waste plume in various stages of degradation; the predominant direction of movement of the waste plumes imaged was to the southeast; the average drift velocity for surface drogues and the waste plumes was about 0.5 knots; and the waters at the test site were highly stratified and stable in the summer and nearly homogeneous in the winter. In general, it appears that rapid movement toward general, it appears that rapid movement toward shore can occur primarily during storms. How-ever, the plume is rapidly dispersed and diluted and the probability of an identifiable plume con-taining heavy concentrations of acid waste reaching the shore is quite low. (Sinha - OEIS) W77-11894

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ASSESSMENT OF OFFSHORE DUMPING IN ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Labe

mospheric Labs.

mospheric Laos.
For sale by Superintendent of Documents, GPO, Washington, DC, 20402. NOAA Technical Report ERL 332-MESA 3, April 1975. 89 p, 57 fig, 5 tab, 32 ref. Charnell, R. L. (Ed.).

Descriptors: *Water quality, *Circulation, *Waste disposal, *Ecosystems, *Environmental effects, *Baseline studies, *Water pollution sources, New York, Sewage disposal, Sedimentation, Path of ollutants.

pollutants. Identifiers: *Outer Continental Shelf, *Ocean dumping, *New York Bight, Physical oceanog-raphy, Chemical oceanography, Geological raphy, Chemoceanography.

Analyses of the apex ecosystem of the New York Right as understood at the end of July 1974 is sum-marized. The three parts of the report, physical, geological, and chemical oceanography, represent three different single-discipline views of a complex ecosystem. Conclusions though considered tentative are nevertheless immediately useful in preliminary assessment of the environmental significance of sewage sludge dumping in the New York Bight apex. The general movement of water over the continental shelf off southern New England and the Middle Atlantic States is to the gland and the Middle Atlantic States is to the west and south, parallel to the continental margin. The net current is, however, masked by high spatial and temporal variability. Structure of the spatial varibility in currents of the Bight apex has been a prime focus of the MESA project; temporal variability is the principal impediment to its rapid elucidation. Nonbiodegradable carbohydrates, ossibly derived from sewage, are significant conpossibly derived from sewage, are significant contributors to the sedimentary organic matter. The apex of the Bight seems to be enriched in car-bohydrates (or sewage-derived materials) as com-pared with the lower Hudson Shelf Valley and New Jersey shore. The dumped sewage sludge undergoes substantial alteration before and after settling to the sediment and/or admixture with natural ung to the sediment and/or admixture with natural nonorganic sediments. It is not possible, using cur-rently available techniques, to distinguish between sedimentary organic matter derived from barge-dumped sewage sludge or derived from other sources of treated or untreated sewage. (Sinha -OEIS) W77-11896

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS.

Texas A and M Univ., College Station. Dept. of

In: Summary Report of IDOE Research (1974) p 253-267, 10 fig, 5 ref. NSF-GX-30196, GX-37344.

Descriptors: *Monitoring, *Water quality, *Resources development, *Oil pollution, *Water pollution sources, *Seepage, Drilling, Baseline studies, Offshore platforms, Gulf of Mexico. Identifiers: *Outer Continental Shelf, Petroleum hydrocarbons, Natural seepages.

It appears that both natural and man-derived sources of petroleum hydrocarbons give rise to anomalously high concentrations of the low molecular weight components over areas and volumes much larger than the visible manifestation of bubbles from natural seeps or the effluent from offshore platforms and ships. As much of the mass of the bubbles from natural gas seeps goes into solution on rising through the water column, near-bottom concentrations should be most indicative of the presence of these seeps. On the other hand, near-surface concentrations of low molecular weight hydrocarbons should be indicative of

man's contributions. The impending environmental baseline program on the outer continental shelf of Florida presents an ideal opportunity to determine the hydrocarbon history of an offshore area, from a relatively virgin to a highly developed state. It is recommended that a detailed near-bottom and near-surface low molecular weight hydrocarbon survey be made concomitantly with an acoustical profiling program for seep detection as soon as possible. Following this initial study a more lei-surely seasonal monitoring program for just the near-bottom and near-surface hydrocarbon concentrations during the entire outer continental shelf drilling and production operation is recom-mended. These periodic surveys should allow an early warning of possible damage to the Eastern Gulf Coast ecosystem. (Sinha-OEIS)

A SHIPBOARD OIL-IN-WATER CONTENT MONITOR BASED ON OIL FLUORESCENCE, Baird-Atomic, Inc., Bedford, Mass. Government

For primary bibliographic entry see Field 5A. W77-11905

SHIPBOARD OIL-IN-WATER MONITOR, Beckman Instruments, Inc., Anaheim, Calif. Advanced Technology Operations.
For primary bibliographic entry see Field 5A. W77-11910

DISPERSAL OF PHYTOPHTHORA PAL-MIVORA SPORANGIA BY WIND-BLOWN

New York State Agricultural Experiment Station, Geneva. Dept. of Plant Pathology. For primary bibliographic entry see Field 3F. W77-11927

EVALUATION OF POTABLE WATER AS A VEHICLE OF TRANSMISSIBILITY AND VIA-BILITY FOR HERPESVIRUS,

North Dakota State Univ., Fargo. Dept. of Virology and Pharmacology.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 427, Price codes: A02 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Research Report No. WI-222-012-76, August, 1976. 9 p, 6 ref. OWRT B-022-NDAK(1), 14-31-0001-3923.

Descriptors: Water pollution, Temperature, Viricides, *Viruses, *Potable water, Path of pollu-tants, North Dakota, Human diseases, Public health, Pollutant identification, Filters. Identifiers: *Herpesvirus.

The primary obstacles in evaluation of water conation with viruses are to maintain the virus survival during transportation and to concentrate the viruses sufficiently to demonstrate their presence in water under laboratory conditions. This was achieved by utilizing an AP-25 fiberglass prefilter over an HA-47 mm - 0.4 micron pore filter prefilter over an HA-4/ mm - 0.4 micron pore filter (Millipore Corporation). Prefilter virus retention ranged from 30 to 43 percent while concomitantly the HA filter membrane retained 33 to 46 percent. Virus was never detected in the filtrate. The addi-tion of 2x MEM plus antibiotics followed by sonication was the most effective method of recovery of viruses from the filters. The virus survived best or viruses from the futers. The virus survived oes in water at a pH of 7 but isolates were obtained at 6 to 8.5 pH. The optimum temperature for survival was 2 degrees C (36 hours) but survival was evident at 37 degrees C for 12 hours. Contamination of water with soil, straw and bovine feces prolonged survival time. Complete destruction of virus resulted when water was exposed to direct sunlight for one hour. Viruses placed in a flowing stream survived for 24 hours and was detectable one mile from the site of deposit indicating that

this would afford an ideal route of viral spread. It was also demonstrated that cotton and polyester had no virucidal effects while calcium alginate wool was extensively virucidal. W77-11935

THE DIFFERENTIATION OF INORGANIC AND ORGANOMERCURY SPECIES IN AQUEOUS

SAMPLES, North Dakota Univ., Grand Forks. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-11936

ACCUMULATION OF NUTRIENTS IN SOIL BENEATH HOG MANURE LAGOONS, Ontario Dept. of Agriculture and Food, Toronto. Dept. of Land Resource Science. M. H. Miller, J. B. Robinson, and D. W. Gallagher. Journal of Environmental Quality, V. 5, No. 3, p 279-282, July-Sept., 1976. 6 tab, 11 ref.

Descriptors: Lagoons, Soils, Sampling, *Nutrients, Feed lots, Groundwater, Seepage, Waste storage, Nitrogen, Phosphorus, *Farm wastes, Hogs. Identifiers: *Swine wastes.

The soils beneath 4 hog manure lagoons were sampled during the spring and summer of 1974 to determine the extent of nitrogen and phosphorus accumulation. Arrangements were made with lagoon owners to lower the manure level as far as feasible. Lagoon 1, a 2-year-old lagoon, was on a clay loam to clay calcareous till. Lagoon 2, a 2year-old lagoon, was on a lacustrine clay deposit.
Lagoon 3, a 10-year-old lagoon, was on a loam to
sandy loam calcareous till. Lagoon 4, an 8-year-old
lagoon, was on layered fine sandy loam, silt loam
and silty clay loam. Levels of NH4-N and soluble P were very high in the top 10 cm of lagoon 1, but decreased sharply at lower depths. Soluble P at the 10-20 cm level was not above the background level (0.05-0.20 microgram/g). NH4-N at the 20-30 cm depth was slightly above the background level (1.6-7.1 microgram/g). The NO3-N level in the soil was very low. The NH4-N content below lagoon 2 was very high in the top 20 cm but was not above background (0.3-1.5 microgram/g) below that depth. Soluble P and nitrate nitrogen did not accumulate below lagoon 2. This may have been due to removal of the upper 1-2 cm of soil with the thick layer of organic material that was present in this lagoon. The NH4-N content of the soil below lagoon 3 was very high even at the 140-150 cm depth compared to the background levels (< 1 microgram/g). Soluble P accumulated in the 0-10 cm depths but not at deeper depths. NO3-N levels were very low at all depths. NH4-N levels in lagoon 4 were very high at all depths sampled-even at a depth of 400 cm. Soluble P was very high in the top 30 cm. NO3-N levels increased between sampling times, indicating the conversion of NH4-N to NO3-N took place following emptying of the lagoon. Clay content and age of lagoons 1 and 2 seemed to be the factors involved in the contrast-ing results between lagoons 1 and 2 and lagoons 3 and 4. The experiment indicated that the most satisfactory use of lagoons would be on fine-tex-tured soils. (Merryman-East Central)

HOG MANURE WORTH \$3.50 PER TON AS FERTILIZER.

Wallaces Farmer, V. 102, No. 5, p 11, March 12,

Descriptors: Liquid wastes, *Fertilizers, Odor, Agricultural runoff, Water pollution, Economics, *Farm wastes, Hogs, Costs. Identifiers: *Swine manure, Land disposal, Cropland management, Manure pits, Agitation.

A. L. Sutton, Purdue University animal scientist, reports that liquid swine manure is worth about

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\$3.50 per ton as a fertilizer if it is applied uniformly as near to the planting date as possible. An even better return could be realized by developing a manure management plan. The most effective planning depends on a nutrient analysis of the waste, compared with a soil test of the land and the nutrient requirements of the crops to be grown. Applying manure to corn, sorghum and small grains can increase the dollars benefit. Maximum corn yields have resulted from applying 40 to 80 tons of swine manure per acre per year on top of the soil. When supplementing the soil with a com-mercial fertilizer, this rate can be decreased. Sutton offers the following recommendations to producers who plan to apply liquid manure to cropland. First, the producer must remember that gas liberated from the manure pits is deadly. Conequently, adequate ventilation should be allowed while agitating the manure. Agitation of the manure facilitates removal of settled solids and uniformly distributes the nutrients. Reasonable distances from ponds, streams, open ditches, and residential areas should be maintained when applying manure in order to minimize runoff and odor problems. Actual spreading should be done early in the day, and manure should not be applied to unlevel frozen ground or water saturated soils. Soil injection or immediate incorporation of manure into the soil maximizes its fertilizer value and minimizes its odor problems. (Keel-East Cen-W77-11969

INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS

New Zealand Agricultural Engineering Inst., Lin-

D. J. Hills

Journal Water Pollution Control Federation, V. 48, No. 4, p 695-709, April, 1976. 7 fig, 7 tab, 26 ref.

Descriptors: *Infiltration rates, Groundwater, Soils, "Sealants, Sampling, Chemical analysis, Hydraulic gradient, Bentonite, Nitrates, Am-monia, Chemical oxygen demand, Hydrogen ion concentration. Farm wastes.

Identifiers: *Anaerobic lagoons, Dairy wastes, Sodium carbonate, Sodium tripolyphosphate, Total solids, Volatile solids.

Research was done to augment present information on parameters affecting infiltration rate and quality of infiltrate from anaerobic lagoons and to investigate possible sealing techniques. Twelve pilot-scale anaerobic lagoons treating dairy shed wastes were constructed and operated for a year. Variables were soil type -- loam, silt loam, sand loam, and clay loam; pond depth -- 2, 3, and 4 m; compacted bottom soil thickness -- 15, 25, and 35 cm; and soil additives - bentonite, sodium carbonate, and sodium tripolyphosphate. Infiltration rates were monitored. Samples of the feed, lagoon liquor, and infiltrate were chemically analyzed for nitrate, ammonia and organic nitrogen, chemical oxygen demand (COD), pH, total solids (TS), and atile solids (VS). The following conclusions were drawn: (1) Contamination of groundwater with total nitrogen, COD, and TVS from properly constructed anaerobic lagoons is very small. (2) The amount of infiltrate and pollutants increased in the following order of the soil types used: clay loam, loam, sand loam, silt loam. (3) Additives that chemically affect soil structure to produce clogging are of little value in anaerobic lagoon construction. (4) The soil's hydraulic conductivity attained under anaerobic biological conditions seems to be a function of the inverse of the hydraulic gradient. (5) The concentration of pollutants in the infiltrate seems to be a function of the hydraulic gradient. (6) The ultimate sealing mechanism seems to be soil pore clogging that penetrates below the soil surface. Clogging is not solely a surface phenomenon. (Merryman-East USING LIQUID POULTRY WASTES IN WOODLANDS,
Connecticut Agricultural Experiment Station New

For primary bibliographic entry see Field 5E. W77-11979

NATURE AND IMPACT OF STREAM INPUTS ON A WATERSHED BASIS, North Carolina State Univ. at Raleigh. Dept. of

Biological and Agricultural Engineering. F. J. Humenik, M. R. Overcash, F. Koehler, L. Bliven, and W. S. Galler.

Paper No. 76-2564, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 14 p. 7 tab, 7 ref.

Descriptors: Agricultural runoff. Water pollution sources, Sampling, Chemical analysis, Algae, Watershed management, Pollutant identification, Farm wastes.

Identifiers: Rural runoff, Statistical survey, *Chowan River(NC).

A statistical survey of small subbasins in the Chowan River watershed was made to determine the feasibility of making areawide assessments of the magnitude and impact of rural runoff. Fifteen subbasins were randomly selected to study the potential of stratified random sampling as a monitoring strategy. The basin was stratified on the basis of soil-topographic-land use factors. The 4 strata chosen were: (1) poorly-drained Coastal Plain; (2) well-drained Coastal Plain (W); (3) agricultural Piedmont; (4) silvicultural Piedmont. Continuous monitoring and grab sampling results were compared at 5 sites. Long-term averages were found to be similar for the total basin, but individual runoff events had more impact on concentration and transport, especially at sites with human intervention. (Merryman-East Central) W77-11980

ALL-PLASTIC SUCTION LYSIMETERS FOR THE RAPID SAMPLING OF PERCOLATING

Department of Agriculture, Ashburton (New Zealand). Winchmore Irrigation Research Station. For primary bibliographic entry see Field 5A. W77-12005

PHYSIOLOGICAL CHARACTERISTICS MERCURY UPTAKE BY TWO ESTUARINE

Hawaii Univ., Honolulu. Dept. of Zoology. S. N. Luoma

Marine Biology, Vol. 41, p 269-273, 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Metals, *Mercury, *Path of pollu-tants, *Mode of action, *Animal physiology, Shrimp, Invertebrates, Worms, Metabolism, Estuaries, Absorption, Chemical reactions, Bioassay, Toxicity, Chemical properties. Identifiers: Polychaetes, Palaemon debilis, Ne-

anthes succina, Bioaccumulation.

Due to the transformation of mercury to a slowly exchanging form within organisms, short expo sures of the organisms to the metal resulted in its rapid uptake and slow loss. The extent of the difference between exposure time and depuration time depended upon the rate of transformation during uptake. For the polychaete worm Neanthea succina and the shrimp Palaemon debilis such transformations were extremely rapid. The rate of Hg exchange from the slowly exchanging form was similar among a wide variety of species. This suggested that interspecies differences in bioconcentration and toxicity were strongly influenced by differences in physiological permeability to the metal and rates of biochemical transformation. (Klein) W77-12007

INVESTIGATIONS ON THE SIMULTANEOUS UPTAKE AND RELEASE OF MERCURY BY DUNALIELLA TERTIOLECTA, Institut fuer

Kiel Univ. (West Germany). Meereskunde. For primary bibliographic entry see Field 5C, W77-12014

ORGANOCHLORINE RESIDUES IN MATER-NAL BLUBBER, MILK, AND PUP BLUBBER FROM GREY SEALS (HALICHOERUS GRYPUS) FROM SABLE ISLAND, NOVA

SCOTIA, Bedford Institute of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab. R. F. Addison, and P. F. Brodie. Journal of the Fisheries Resear

Canada, Vol. 34, p 937-941, 1977. 2 tab, 19 ref.

Descriptors: Aquatic animals, Mammals, *Organic compounds, *Animal physiology, *Path of pollutants, *Chlorinated hydrocarbon, *DDT, *Pesticides residues, Bioassay, Organic pesticides, Organic compounds, Analytical techniques, Polychlorinated biphenyls.

Polychlorinated dipnenyis.

Identifiers: *Grey seals, *Halichoerus grypus,
Bioaccumulation, Tissue analysis, Nova Scotia.

Residues of DDT group insecticides and of PCBs were measured in samples of maternal blubber, milk, and pup blubber from grey seals (Halichoerus grypus) from Sable Island, N.S. Mean total of DDT and PCB levels in maternal blubber lipid were 14.0 and 14.5 microgram/g, respectively. Concentrations of DDT and PCBs in milk lipid were approximately 60 and 30%, respectively, of those found in maternal blubber lipid, suggesting a partial barrier to passage of these residues through mammary tissue. Concentrations in pup blubber lipid were the same as, or slightly higher than, those in milk lipid. (Klein) W77-12019

EFFECTS OF SALINITY ON THE NET UPTAKE OF ZINC BY THE COMMON MUSSEL MYTI-

Melbourne Univ., Parkville (Australia). Dept. of Zoology. For primary bibliographic entry see Field 5C.

W77-12022

HEAVY-METAL CONTAMINATION BY AT-MOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO FISH POPULATIONS,

Toronto Univ. (Ontario). Dept. of Geology,; Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering

J. C. VanLoon, and R. J. Beamish. Journal of the Fisheries Research Board of Canada, Vol 34, p 899-906, 1977. 2 fig, 3 tab, 15

Descriptors: Metals, *Zinc, *Copper, *Sulfur compounds, *Heavy metals, Lakes, *Sulfates, Chemical analysis, *Fallout, Freshwater fish, Resistance, Atmosphere, Toxicity, Analytical techniques, Inorganic compounds, Water quality, *Path of pollutants, Aquatic life, Cadmium, Iron, Lead, Nickel, Industrial wastes, *Canada. Identifiers: Accumulation, Bioaccumulation, *Flin Flon Lakes, Manitoba, Smelters, Pollution

High concentrations of zinc and other heavy metals were found in lakes in the immediate vicinity of the Flin Flon smelters. In a study of 31 lakes, 7 had Zn levels above 100 micro-g/l, 6 had levels between 50 and 100 micro-g/l, and the remainder had concentrations less than 50 micro-g/l. The accuracy and precision of the heavy metal chemical analysis were evaluated using intercomparisons with other laboratories and a standard reference water. A linear relationship was demonstrated

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

between log 10 concentrations of Zn, Cu, and SC4(2-) and log 10 distance from the smelter, suggesting atmospheric fallout as the main source of these substances in the lakes. Fishes were more tolerant of these high zinc concentrations than would be expected on the basis of the responses of fish and other aquatic organisms to similar concentrations of zinc in some laboratory toxicity tests. (Klein). W77-12027

CRUSTACEAN ZOOPLANKTON COMMUNITIES AS INDICATORS OF LIMNOLOGICAL CONDITIONS: AN APPROACH USING PRIN-CIPAL COMPONENT ANALYSIS,

Toronto Univ. (Ontario). Dept. of Zoology. For primary bibliographic entry see Field 5A. W77-12029

DISTRIBUTION AND DEGRADATION OF DINITROANILINE HERBICIDES IN AN AQUATIC ECOSYSTEM, Agricultural Research Service, Beltsville, Md.

Agricultural Environmental Quality Inst. P. C. Kearney, A. R. Isensee, and A. Kontson.
Pesticide Biochemistry and physiology, Vol 7, p 242-248, 1977. 3 fig, 3 tab, 13 ref.

*Herbicides. Descriptors: *Degradation(Decomposition), *Biodegradation, *Distribution, Catfishes, Persistence, *Environmental effects, Radioisotopes, Carbon radioisotopes, Marking techniques, Laboratory tests, Path of pollutants, Aquatic algae, Aquaria. Identifiers: Bioaccumulation, *Dinitroaniline herbicides, Trifluralin, Profluralin, Dinitramine, Chlornidine, Fluchloralin, Butralin, Daphnia, Helisoma, Oedogonium, Gambusia, Tissue analy-

The accumulation potential of six, structurally related, dinitroaniline herbicides was investigated in an aquatic ecosystem. The herbicides investigated were trifluralin, profluralin, dinitramine, chlor-nidine, fluchloralin and butralin. The herbicide (0.1 mg) plus 1 micro Ci of 14C-labeled herbicide was adsorbed on 100 g of soil (1 ppm), added to in-dividual aquariums, and flooded with 4 liters of water. Algae, snails, and daphnia were added, and 14C in water was monitored for 30 days. Fish were added on Day 30, and all components were har-vested 3 days later. Bioaccumulation ratios (concentration in organism/concentration in water) for fish depended on the amount of their exposure to sunlight: Aquariums held in the dark had higher ratios for fish (235-755) than did those exposed to sunlight (32-83). Bioaccumulation ratios in the dark for fish based on 14C from bound soil residues of butralin and profluralin were 76 and 119, respectively. Direct repeated applications of profluralin (without soil) at 4-day intervals resulted in a rapid increase, then a decrease in bioaccumulation ratios for Gambusia, but a con-tinuous increase for catfish. (Katz)

RELATIONSHIPS BETWEEN HEAVY METALS AND MAJOR CATIONS ALONG POLLUTION

Durham Univ. (England). Dept. of Botany.

C. R. C. Sheppard.

Marine Pollution Bulletin, Vol 8, No 7, p 163-164, 1977, 2 tab, 4 ref.

Descriptors: *Heavy metals, Lead, Copper, Nickel, Zinc, Calcium, Sodium, Potassium, Magnesium, *Spectrophotometry, *Cations, Environmental effects, Analytical techniques, Water pollution effects, Statistical methods.

Identifiers: Tissue analysis, *Urchins, *Limpets, *Atomic absorption spectrophometry, *Spearman ranked coefficient, *Electrochemical gradient.

Along some pollution gradients, animal tissue con-centrations of several major, physiologically im-

portant cations vary greatly in a way that cor-responds with levels of toxic metals. Changes in concentration from normal of these major cations can be as much as fourfold which may be an un-derlying cause of much of the stress experienced by these species in polluted environments. (Katz) W77-12033

ABNORMAL TERNS, SICK SEA AND SHORE BIRDS, ORGANOCHLORINES AND ARBOVIRUSES IN THE INDIAN OCEAN, Aberdeen Univ. (Scotland). Seabird Group For primary bibliographic entry see Field 5C. W77-12034

CONCENTRATION PATTERN OF CHEMICAL CONSTITUENTS IN A PAPER MILL'S EF-FLUENT PLUME: DYNAMICS AND MODEL, Ontario Ministry of the Environment, Toronto (Ontario). Water Resources Branch. J. Polak, and M. D. Palmer.

Journal of the Fisheries Research Board of Canada, Vol 34, p 805-816, 1977. 7 fig, 9 tab, 11

Descriptors: *Effluents, *Model studies, *Lakes, *Winds, *Pulp wastes, *Dynamic programming, *Lake Superior, Theoretical analysis, Movements, Linear programming, Industrial wastes, Water quality, Water pollution sources, Bays,

Identifiers: *Plume, *Wind direction, Nipigon

The variation of conductivity in the effluent plume for a paper mill discharge on Lake Superior was studied to provide data for predictive models. The study included measurement of local winds and currents which were analyzed and related to the plume's location. To determine the spatial distribution of th plume, a statistical one-dimensional model relating plume conductivity and distance from the outfall and a two-dimensional phenomenological model assuming elliptically shaped isopleths were developed. It was found that chemical constituents of the plume can be expressed as linear functions of conductivity. The models thus enable the definition of the lake area affected by the effluent chemicals for different wind conditions. (Klein)

CHLORINE DISSIPATION AND TOXICITY PRESENCE OF NITROGENOUS COMPOUNDS, Florida Inst. of Tech., Melbourne. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.

W77-12042

A CHARACTERIZATION OF THE SOURCES OF PETROLEUM HYDROCARBONS IN LAKE WASHINGTON,

Washington Univ., Seattle. Dept. of Chemistry. S. G. Wakeham.

Journal Water Pollution Control Federation, Vol 49, p 1680-1687, 1977. 3 fig, 1 tab, 29 ref.

Descriptors: *Lakes, *Water pollution sources, *Organic compounds, *Oil pollution, *Oil wastes, Organic wastes, Sediments, Path of pollutants, Urban runoff, Runoff, River flow. Identifiers: *Lake Washington(Wash), Automobile traffic, Petroleum hydrocarbons.

Sediments of Lake Washington contain high levels of petroleum hydrocarbons. High concentrations of petroleum-type hydrocarbons were found in urban stormwater runoff. The most likely source of the hydrocarbons in the stormwaters was considered to be the release by automobile traffic of the lubricating oils and greases to urban streets. In contrast, river waters flowing in to the lake contained much lower hydrocarbon levels. However, because of the much greater volume of flow for

the rivers compared to the storm waters, the contribution of hydrocarbons by the rivers was nearly equal to that of the stormwaters. Rainfall and dust contributed lesser amountsj of petroleum hydrocarbons to Lake Washington. (Klein)

BHC RESIDUES OF DOMESTIC ORIGIN: A SIGNIFICANT FACTOR IN POLLUTION OF FRESHWATER IN NORTHERN IRELAND, Queen's Univ., Belfast (Northern Ireland) Dept. of Agricultural and Food Chemistry.

D. B. Harper, R. V. Smith, and D. M. Gotto. Environmental Pollution, Vol 12, p 223-233, 1977. 4 fig, 3 tab, 22 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Path of pollutants, "Water pollution sources, Ef-fluents, "Mayflies, Aquatic insects, Invertebrates, Wastes, Larvae, Larvae growth stage, Water quali-ty, Organic compounds, Domestic wastes, Rivers, ty, Organic compou *Pesticide residues.

*Benzenehexachloride residues, Identifiers: *BHC, Baetis rhodani, Caenis moesta, Lough Neagh, Northern Ireland.

The concentration of BHC (Benzenehexachloride) residues in the rivers discharging into Lough Neagh showed a high correlation with urban population density in the catchment area of the riv Investigations demonstrated that this correlation arose as a result of discharged sewage effluents containing BHC. BHC in such effluent appeared to have a domestic- rather than an agriculture or industrial - origin, probably arising from the rise of wood preservatives in the home. Studies on the effect of various concentrations of BHC on species of mayfly larvee (Baetis rhodani) and Caenis moesta indicated major reductions in survival time. (Klein) W77-12046

RETENTION OF MERCURY IN THE MUSCLE OF YELLOW PERCH (PERCA FLAVESCENS) AND ROCK BASS (AMBLOPLITES RUPES-

Institute for Fisheries Research, Ann Arbor,

Mich. Fisheries Div. P. W. Laarman, W. A. Willford, and J. R. Olson. Transactions of the American Fisheries Society, Vol 105, No 2, p 296-300, 1976. 2 fig, 3 tab, 13 ref.

*Mercury, *Percury, *Bass, *Rock bass, Growth Descriptors: *Metals, Descriptors: "Metaus, "Metaus, "Yellow perch, *Sunfishes, *Bass, *Rock bass, *Path of pollutants, *Fish physiology, Growth rates, Water pollution effects, Bioassay, Lakes. Identifiers: Bioaccumulation, Lake St. Clair, Fish

Mercury-contaminated yellow perch (Perca flavescens) and rock bass (Ambloplites rupestris) were collected from Lake St. Clair and stocked in two earthern ponds in September 1970. Twenty-six months later, concentrations of total mercury in the fillets had declined 53% in the yellow perch and 59% in the rock bass; however, the mean weight of the fish increased 88 and 183%, respectively, during the same period. All of the redu in mercury concentrations was attributable to dilu-tion by growth. Slight discrepancies between the theoretical and observed reduction of mercury concentrations suggest an initial redistribution of residues from other tissues to the muscle and a continued incorporation of background amounts of mercury during growth. (Klein) W77-12047

LONG-TERM FLUCTUATIONS OF EPIBENTHIC FISH AND INVERTEBRATE POPULATIONS IN APALACHICOLA BAY, FLORIDA, Florida State Univ., Fla. Dept. of Biological

For primary bibliographic entry see Field 5C. W77-12053

Group 5B-Sources Of Pollution

CHARACTERIZATION OF SUSPENDED PAR-TICLES IN SOME PULP AND PAPER MILL EF-FLUENT PLUMES, Canada Centre for Inland Waters, Burlington

(Ontario)

J. K. Leslie.

Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 791-797, 1977. 7 fig., 2 tab., 18 ref.

Descriptors: *Sediments, *Suspended solids, *Effluents, *Pulp wastes, Size, Dimensions, *Particle size, Chemical analysis, Solid wastes, Aquatic drift, Sampling, On-site investigations, Pollutant identification, Industrial wastes, *Path of pollutants, *Lake Superior.

Some physical characteristics of the suspended particles from seven pulp mill effluent plumes were analyzed electronically. An effluent flow rate of 1.2 cubic meters/s contained a mean of 75.9 cubic micrometers/l particulate volume in a size range of 3.2-84.0 micrometers 'diameter.' The visible particle surface area was 334.8 square cm/1, and there were 1045 x 10 to the third power particles/ml. A slight increase in size was detected as the particles aged in the plume. The transported particulates were reduced by dispersion and sedimentation to approximately 5% by a transit of less than 1 km, but effluent was still detectable 2 km from the point source. (Katz) W77-12058

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT, Canada Centre for Inland Waters, Burlington

(Ontario).
J. R. M. Kelso, C. K. Minns, and R. J. P. Brouzes.
Journal of the Fisheries Research Board of
Canada, Vol. 34, No. 6, p 771-775, 1977. 2 fig., 16

Descriptors: *Effluents, *Pulp wastes, *Industrial wastes, *Chemical wastes, Toxicity, Freshwater, Ecosystems, Environmental effects, *Path of pol-lutants, Water pollution sources, *Lake Superior, Lakes, Discharge(Water), Distribution, Canada. Identifiers: *Effluent plume, Nipigon Bay.

Background and scope were provided for joint Ontario Ministry of the Environment and Department of the Environment studies of the effect of a pulp and paper mill effluent in a freshwater ecosystem Brief descriptions of pertinent features of the pulp and paper mill and Nipigon Bay were given as re-lated to studies presented in this volume. (Katz) W77-12059

A NOTE ON TOXAPHENE IN ENVIRONMEN-TAL SAMPLES FROM THE CHESAPEAKE BAY REGION

Westinghouse Ocean Research Lab., Annapolis, Md

T. O. Munson

Bulletin of Environmental Contamination and Toxicology, Vol 16, No 4, p 491-494, 1976. 1 fig, 1 tab, 7 ref.

*Polychlorinated biphenyls, tidues, *Pesticide kinetics, Organic pesticides, *Chlorinated Descriptors: "Polychlorinated biphenyls, *Pesticide residues, "Pesticide kinetics, *Insecticides, "Organic pesticides, *Chlorinated hydrocarbon pesticides, Analytical techniques, *Chesapeake Bay, Water pollution sources, Chemical analysis, Chromatography. Identifiers: "Toxaphene, Upper Chesapeake Bay

Although toxaphene has been reported to be the most widely used insecticide in the United States, residues of toxaphene are seldom found in environmental samples. During a survey of the Upper Chesapeake Bay for chlorinated hydrocar-bon residues several samples were found to contain toxaphene residues. It was noted that toxaphene was most visible in samples that contained low PCB levels (e.g. rainwater), since PCB tends

to obscure the presence of toxaphene in some basic laboratory tests. (Katz) W77-12062

THE UPTAKE AND INTERORGAN DISTRIBU-TION OF MERCURY IN A CARNIVOROUS CRAB.

Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center.

S. N. Luoma. Bulletin of Environmental Contamination and Toxicology, Vol 16, No 6, p 719-723, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Crabs, *Absorption, *Metals, *Distribution, *Mercury, *Path of pollutants, *Animal physiology, Metabolism, Crustaceans, Commercial shellfish, Invertebrates, Tracers, Analytical techniques, Worms, Bioassay, Laborators, tests. Pedicoccipits, techniques. tory tests, Radioactivity techniques.

Identifiers: *Interorgan distribution, *Carnivorous crabs, Thalamita crenata, Bioaccumulation, Tissue analysis, Neanthes succinea, Polycheates.

Carnivorous portunid crabs (Thalemita crenata) were fed 203-Hg labelled polycheates (Neanthes succineal for 13 days. Interorgan distribution of the 203-Hg label in experimental crabs was com-pared to total Hg uptake and interorgan distribu-tions observed in crabs from nature. Feeding rates compared with 203-Hg uptake indicated mercury accumulation into viscera exceeded accumulation into body muscle by 7.5 times. Uptake by viscera exceeded uptake by chela muscle by 20.9 times; uptake by body muscle was 2.7 times that of chela muscle. In contrast to laboratory studies total Hg concentrations in the body muscles of crabs from the estuary were always higher than concentrations in viscera. (Katz) W77-12063

PERSISTENCE OF DISSOLVED ORGANIC COMPOUNDS IN KRAFT PULP AND PAPER MILL EFFLUENT PLUMES,

Canada Centre for Inland Waters, Burlington (Ontario). M. F. Fox

Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 798-804, 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Effluents, *Organic compounds, *Persistence, *Chemical analysis, *Dispersion, *Mode of action, Degradation(Decomposition), Analytical techniques, *Lake Superior, Pulp wastes, Sodium, *Path of pollutants, Water quali-

Identifiers: *Plumes, *Dehydroabietic acid. The persistence of dissolved organic compounds

in the effluent plumes of a pulp and paper mill on the north shore of Lake Superior was studied in 1974. Approximately 90 organic compounds were observed of which 36 (including all the major ones) were identified. The despersion of five of these compounds was examined quantitatively. Dehydroabietic acid was the only major organic compound observed to exhibit measurable persistence 2000 m from the effluent discharge. At 2000 m from the discharge, levels of 30 microg/I dehydroabietic acid were detected within the plume and 15 microg/I outside the effluent plume. The disappearance of dehydroabietic acid parrallels that of the conservative ion Na+, indicating dilution by the receiving water as the only signifi-cant short-term removal mechanism. (Katz) W77-12065

CALORIC CHANGES ALONG PULP AND PAPER MILL EFFLUENT PLUMES,

Canada Centre for Inland Waters.

Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 784-790, 1977. 2 fig, 2

Descriptors: *Effluent, *Energy transfer, *Energy *Respiration, Sedimentation, solids, Pulp wastes, Tracers, Dyes, Solid wastes, Lake Superior, dissipation, Suspended solids Rhodamine, Dyes, Industrial wastes, Path of pollutants, Biodegradation. Distribution. Identifiers: *Calories.

Eight pulp and paper effluent plumes in Nipigon Bay were tracked with Rhodamine dye to deter-mine dilution and nondilution losses of calories with distance and time. Dilution, as determined by Na+ decreases, accounted for 98.5% of the decrease in caloric concentration along centerline trajectories of plumes over 2000 m in 7.5 h: mean caloric concentration decreased from 1583 cal/l in effluent to 50 cal/l at background stations. Noneffluent to 50 cal/l at background stations. Non-dilution caloric changes were estimated by two methods, first by examination of the main processes (respiration, settling of particles, and primary production) and, secondly, by interpreta-tion of time series of direct measurements of caloric concentrations. By the first method, mea-surement of resporation indicated loss of 2.1 cal/l, while particle loss from plumes was 2.5 S. cal/l and while particle loss from plumes was 25.5 cal/l and while particle loss from plunies was 25.3 call and accrual of calories by primary production was 0.5 cal/l. Integration of these results yielded an estimate of 27.1 cal/l net nondilution loss in caloric concentration along centerline trajectories over the average distance of 2000 m. By the second method, direct measurement of decrease in caloric concentration gave an estimate of nondilution loss of 45 cal/l over 2000 m. approximately 17% of ef-fluent calories were used in biodegradation and lost in sedimentation from the plume within 2000 m of the source. Environmental degradation, in terms of dissolved oxygen conditions and deposition of particles, apparently was only locally significant (Katz) W77-12066

DISTRIBUTION OF DEHYDROABIETIC ACID IN SEDIMENTS ADJACENT TO A KRAFT PULP AND PAPER MILL, Canada Centre for Inland Waters, Burlington

(Ontario).

B. Brownlee, M. E. Fox, W. M. J. Strachan, and S.

Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 838-843, 1977. 4 fig, 3

Descriptors: *Sediments, *Pulp wastes, Sampling, *Lake sediments, *Resins, *Bottom sediments, *Chemical wastes, *Effluents, *Acid soils, Sediment distribution, Industrial wastes, Water pollument tion effects, Water pollution sources, Distribution patterns, Soil analysis, Lake Superior, Tracers, Lead, Radioisotopes, Lead radioisotopes, Mode of action, Path of pollutants, Water chemistry, *Acids.

Identifiers: Sediment Dehydroabietic acid, Nipigon Bay.

Sediments adjacent to a kraft pulp and paper mill on western Nipigon Bay, Lake Superior, were examined for resin acids. Dehydroabietic acid was the predominant resin acid with surficial concentrations of less than 5-100 microg/g. The aeral distribution indicated the mill to be the primary source of this compound. Depth profiles of the acid and core dating by 210Pb methods enabled the calculation of a mean source. calculation of a mean sediment accumulation rate of 0.11 cm/yr and a half-life for the disappearance of dehydroabietic acid in the sediments of approximately 21 yr. A half-life of 0.12 yr was estimated for this compound in the water column. It appears, therefore, that the primary removal mechanism of dehydroabietic acid is degradation in the water column. (Katz) W77-12067

DISTRIBUTION OF SOME ORGANIC COM-POUNDS IN THE RECEIVING WATERS OF A KRAFT PULP AND PAPER MILL, Canada Centre for Inland Waters, Burlington

B. Brownlee, and W. M. J. Strachan. Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p. 830-837, 1977. 3 fig, 3 tab, 32 ref.

Descriptors: *Effluents, *Pulp wastes, *Sampling, *Distribution, *Organic compounds, *Path of pollutants, Water quality, Chemical analysis, Industrial wastes, Benthos, Lake Superior, Acid Dispersion, Water pollution, Sediments, Seston. Acids, Identifiers: Receiving water, *Dehydroabietic acid, *Palmitic acid, Dioctyl acetovanillone, Sandaracopimaric acid, 7-Oxodehydroabietic acid.

Water, seston, sediment, and macrophyte samples water, seston, seament, and macrophye samples were collected from Nipigon Bay, Lake Superior at distances up to 6.8 km from the effluent discharge of a kraft pulp and paper mill at Red Rock, Ontario. Fifteen compounds have been identified in mill effluent and six of these were found in samples from the Bay. Mill-related compounds were found most often in water and sediment samples, less often in seston samples, and in none of the macrophyte smaples. Dehydroabietic acid, present in mill effluent in excess of 1 mg/l, was found in most water and sediment samples and a few seston samples. This compound was good indicator of the areal influence of the ef-fluent. Palmitic acid and dioctyl phthalate were also widely distributed. Acetovanillone and sandaracopimaric acid were found in one water sam-ple 1.0 km from the discharge. 7-ox-odehydroabietic acid was found in five water samples at distances of up to 4.7 km from the discharge. This was apparently the first time that this compound has been reported in a mill effluent or in environmental samples. (Katz) W77-12068

A KINEMATIC REFERENCE FRAME FOR ESTUARIES OF ONE DIMENSION

University Coll., Dublin (Ireland). Dept. of Civil

I.P. J. O'Kane

In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 101, p 797-807, 1974. 6 fig. 16 ref.

*Estuaries, *Water *Mathematical models, *Diffusion, Mathematical studies, Mathematics, Equations, Solutes, Tidal effects, Tidal waters, Model studies, Analytical techniques, Analysis, Distribution patterns. Identifiers: Kinematic reference frame, Mass halance.

The obvious reference frame for water quality parameters in an estuary is the bank. A kinematic reference frame can be set up so that the tidal harmonics present in such parameters are largely removed. The kinematic frame oscillates so as to maintain a constant volume of water between any observer on this frame and the head of the estuary. The equations of transformation from one frame to the other may be found either analytically or in numerical form. The diffusion equation was transformed and examined. By induction from field data it may be possible to show that the harmonics in the dispersion term which remain after transfor-mation are negligible. The 'tidal smear' approximation can be used to remove the remaining har-monics from a class of intermediate cases. The removal of tidal harmonics also should allow the use of rougher finite difference grids. The main advantage of the transformation over its moving average rival is the preservation of all information available. (See also W77-06708) (Humphreys-ISWS) W77-12109

A MATHEMATICAL MODEL FOR SIMULAT-ING THE TEMPERATURE STRUCTURE OF STRATIFIED RESERVOIRS AND ITS USE IN RESERVOIR OUTLET DESIGN, Water Resources Engineers, Inc., Walnut Creek,

L. A. Roesner, W. R. Norton, and G. T. Orlob. In: Mathematical Models in Hydrology, Volume 2; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrolo Sciences Publication No. 101, p 848-861, 1974. 7

Descriptors: *Thermal stratification, *Reservoirs, *Mathematical models, *Water temperature, Water quality, Analytical techniques, Dams, Outlet works, Heat balance, Simulation analysis, Model studies, Heat transfer, Discharge(Water), Flow, Stratification, Hydraulics, Outlets, Computer models, Hydrologic aspects.
Identifiers: *Dworshak Dam(Idaho).

One of the water quality effects of reservoir construction and operation that is currently receiving much attention is the effect of the reservoir or water temperature, both within the impoundment and in the release waters. This paper briefly described a mathematical model for predicting the temperature regime of thermally stratified reservoirs and illustrated use of the model for evaluating the effectiveness of alternative reservoir outlet designs for downstream temperature control. The illustration related the application of the model to Dworshak Dam on the North Fork of the Clearwater River, Idaho. On the basis of the temperature evaluations made with the model, a 17 million dollar multigated outlet package was incorporated into the outlet design plans for the dam. (See also W77-06708) (Humphreys-ISWS) W77-12114

FULVIC ACID AND AQUATIC MANGANESE TRANSPORT, Massachusetts Univ., Amherst. Dept. of Chemis-

O. T. Zajicek, and R. B. Pojasek. Water Resources Research, Vol 12, No 2, p 305-308, April 1976. 3 tab, 2 fig, 30 ref.

Descriptors: *Manganese, *Return flow, Water quality, Rivers, Water pollution sources, Organic compounds, *Path of pollutants, Acids. Identifiers: Manganese transport, *Fluvic acid.

The role of allochtonous organic substances in the solubilization of manganese was investigated. The organic substances used were leachates of variety of watershed materials, fulvic acid, and a number of pure model compounds. It was found that manganese concentration and water color were directly proportional, in most cases, and that the organic materials comprising the color are ef-fect in dissolving manganese oxides and stabilizing the dissolved manganese in solution. (Skogerboe-Colorado State) W77-12136

SOLUBILITY AND AVAILABILITY OF CADMI-UM IN CADMIUM-SLUDGE AMENDED SOIL, Colorado State Univ., Fort Collins. J. J. Street. PhD Thesis, 1976, 126 p.

Descriptors: *Cadmium, *Metals, *Heavy metals, *Trace elements, *Absorption, Application methods, Phosphorus, Soil chemistry, Soil contamination, Agriculture, Waste disposal, Sludge disposal, Waste water treatment.

The distribution of Cd(+2) in soils and its availability to plants have been investigated. Cadmium carbonate and cadmium phosphate were found to inhibit cadmium activity in soils, with CdCO3 being the major controlling solid phase when high concentrations of Cd were added. Adsorption was found to be the controlling factor on Dc solubility when low concentrations of Cd were added. Uptake of Cd by corn seedlings which had been grown in soils amended with sewage sludge or with cadmium along was investigated. A positive cor-relation was observed between cadmium concentrations in soils and in plants. Cd uptake was found to decrease with increased soil pH and phosphorus levels. Field studies showed that heavy application of Cd-bearing sludges reduced yields and increased Cd concentrations in plants. Reduced uptake, mobility, and solubility of cadmium were ob-served in soils that were alkaline, rich in organic matter, and heavy-textured. (Schulz-FIRL)

WATERFOWL REFUGE EFFECT ON WATER QUALITY: II. CHEMICAL AND PHYSICAL PARAMETERS.

New Mexico Inst. of Mining and Technology, Socorro. or primary bibliographic entry see Field 5A. W77-12148

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY,
Agricultural Research Service, Columbia, Mo.
North Central Watershed Research Center. For primary bibliographic entry see Field 5G. W77-12149

CALLAHAN RESERVOIR: III. BOTTOM SEDI-MENT-WATER-PHOSPHORUS ' RELATION-

SHIPS,
Agricultural Research Service, Durant, Okla.
Water Quality Management Lab.
For primary bibliographic entry see Field 5G. W77-12150

MICHIGAN DIVERSION-STREAM QUALITY PLANNING, Metropolitan Sanitary District of Greater Chicago,

m. For primary bibliographic entry see Field 5G. W77-12163

CHLORIDE ACCUMULATION NEAR CORN ROOTS UNDER DIFFERENT TRANSPIRA-TION, SOIL MOISTURE, AND SOIL SALINITY REGIMES,

Punjab Agricultural Univ., Ludhiana (India). Coll. of Agricultural Engineering. B. K. Sinha, and N. T. Singh.

Agronomy Journal, Vol. 68, No. 2, p 346-348, March-April 1976. 3 tab, 8 ref.

Descriptors: *Corn(Field), *Chlorides, Soil water, *Soil moisture, *Saline soils, Salinity, *Transpiration, *Root zone, Root systems, Root development.

The magnitude of 36Cl accumulation around roots of corn plants exposed to low, medium, and high transpiration rates was studied in laboratory exents using Tulewal loamy sand salinized to ECe of 3 and 6 m mhos/cm with sodium chloride. Radioautographs and quantitative measurements of 36Cl in high transpiration treatment showed the highest concentration of the element in regions closest to the root. At high transpiration rates the chloride content of the soil close to the roots increased while the same soil showed a decrease in the chloride content when the plants were exposed to low transpiration treatment. Chloride con trations in the 'apparent free space' and soil close to the roots was two to three times that in the bulk soil, depending upon the amount of water trans-pired/unit root length. At higher transpiration rates, salt accumulation increased with greater soil moisture content but was either unaffected or decreased closer to the root-soil interface, when the transpiration rate was low. The results indicate that the salinity tolerance limits of plants would be greatly influenced by the prevailing evaporative demand. (Skogerboe-Colorado State) W77-12171

Group 5B-Sources Of Pollution

LEACHING OF PHOSPHATE AND SELECTED CATIONS FROM SANDY SOILS AS AFFECTED BY LIME.

Agriculture, Bangkok (Thailand). Ministry of Agriculture, Bangaou (Thanana). Agricultural Chemistry Div. P. Chaiwanakupt, and W. K. Robertson. Agronomy Journal, Vol. 68, No. 3, p 507-511, May-June 1976. 12 fig, 2 tab, 7 ref.

*Phosphates, Descriptors: Phosphorus, *Phosphates, *Leaching, *Cations, Lime, Groundwater, Soil investigations, *Sands. Descriptors: Identifiers: Soil cylinders.

It is important to determine if and to what extent P moves through some acid sandy soils and, in view of the high cost of fertilizer P and the problems associated with pollution of groundwater, what can be done to prevent or reduce the movement when it occurs. Segmented columns, 25 cm in length and 5 cm in diam., were used to study P leaching in five mineral and one organic soil. A total of 25 or 50 cm H20 was passed through the columns, containing soil from various depths, after treatment in the top 2 cm with 0 to 600 ppm P tagged with 32P. Leaching of K, Ca, and Mg occurred in all soils. The amount was generally related to the CEC or the levels present in the extractable form before the leaching began. Leaching of Fe and Al was determined only on soils where P leaching was appreciable. These ions generally leached with P but there was a direct relationship between leached and 0.1 N HCl extractable ions. These data are of value in evaluating and determining P and lime requirements. (Skogerboe-Colorado State) W77-12172

NUTRIENT TRANSPORT IN RUNOFF FROM

SANDY SOILS, Florida Univ., Gainesville. Dept. of Agricultural Engineering. K. L. Campbell.

Presented at the 1976 Winter Meeting of the American Society of Agricultural Engineers, December 14-17, 1976, Chicago, Illinois. 20 p, 4 fig, 7 tab, 5

Descriptors: Watersheds(Basins), *Water quality, Management, *Nutrients, Streamflow, Return flow, Phosphorus, Nitrogen, *Agricultural runoff, *Sands, Soils.

Two agricultural watersheds were instrumented to determine water quantity and quality measure-ments. The upper watershed of 437 hectares was primarily in forest cover with some pasture. The lower watershed of 208 hectares was mostly in intensive agricultural crop production with some tensive agricultural crop production with some pasture. The following results are from data collected between July, 1975 and June, 1976. 1. Nitrogen and phosphorus loads in streamflow were about proportional to the flow volume in the two watersheds. The average total nitrogen concentration was only about 10% greater in the lower watershed, while the average total phosphorus concentrations were the same in both watersheds.

2. The increased flow volume in the lower watershed occurred mostly during storm periods and was probably primarily due to land use and topography differences between the two watersheds. 3. There were only small average concentration changes between storm flow periods and low flow periods in both watersheds. 4. Partial nutrient balances indicate that nutrient losses in streamflow are a very small part of the total nitrient flow system in these two watersheds. Total nitrogen and phosphorus losses in streamflow were equivalent to about 5% of the commer-cial fertilizer applied in each watershed. Nutrient loads in streamflow also were less than those contributed to the watersheds in precipitation during the period. (Skogerboe-Colorado State) W77-12184

VERTICAL GRADIENTS IN ARTIFICIAL SUB-STRATE-ASSOCIATED PROTOZOAN COMMU-

NITY STRUCTURE IN A STRATIFIED FRESH-WATER LAKE, Vanderbilt Univ., Nashville, Tenn, Dept, of Biolo-

gy. For primary bibliographic entry see Field 5C.

DETERMINATION OF ORGANOCHLORINE DETERMINATION OF ORGANOCHLORING PESTICIDES IN THE TISSUE OF THE BLACK MULLET (MUGIL CEPHALUS) AND THE SILVER MULLET (MUGIL CUREMA), Miami Univ., Coral Gables, Fla. Research and

Teaching Center of Toxicology. D. A. Cubit, W. B. Deichmann, and W. E.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-258 023, Price codes: A02 in paper copy, A01 in microfiche. NOAA Report SG No 2-35147, Reprinted from American Industrial Hygiene Association Journal, p 8-15, January 1976. 2 fig, 5 tab, 12 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, Water pollution sources, *Fish reproduction, *Toxicity, *Mullets, DDT, Dieldrin, Fish physiology, Path of pollutants, Organic compounds, Water quality, Halogenated pesticides, Marine fish, Spawning, Florida, Pollutant identification.

Identifiers: Bioaccumulation, Tissue analysis, Black mullet, Silver mullet, Mugil cephalus, Mugil

Because of the importance on mullet as a Florida fish food source, studies were undertaken to determine their extent of pollution by or-ganochlorine pesticides. Consideration was given to monthly changes in tissue pesticide concentrations-such changes might occur (1) in response to seasonal agricultural pesticide use and therefore changing concentrations in runoff waters, or (2) by a physiological process inherent to spawning.
(Katz) W77-12197

ACCUMULATION AND ELIMINATION OF ALPHA-HEXACHLOROCYCLOHEXANE (ALPHA-HCH) BY THE MARINE ALGAE CHXLAMYDOMONAS AND DUNALIELLA, Rijksinstituut voor de Volksgezondl Bilthoven (Netherlands). Lab. for Toxicology. For primary bibliographic entry see Field 5C. W77-12214 Volksgezondheid,

MODEL KUMULACJI 137CS U KARPIA (CYPRINUS CARPIO L.) A MODEL OF THE CUMULATION OF 137CS IN THE CARP CYPRINUS CARPIO L.), (IN POLISH), Instytut Ksztalitowania Srodowiska, Katowice For primary bibliographic entry see Field 5C. W77-12215

OBSERVATIONS OF AN ASH LAGOON SPILL ON THE NEW RIVER, VIRGINIA, Virginia Polytechnic Inst. and State Univ.,

Blacksburg. Dept. of Biology.

C. H. Hocutt, K. L. Dickson, M. T. Masnik, and J. R. Stauffer. Hydrobiologia, Vol 48, No 3, p 241-245, 1976. 2 fig, 2 tab, 13 ref.

Descriptors: *Alkaline water, *Dispersion *Ecological distribution, Water pollution, Dis *Dispersion. tribution patterns, Speciation, Water types, Sam-pling, Water pollution sources, Environmental ef-fects, Bioassay, Aquatic life, Populations, Indus-trial wastes, Physicochemical properties. Identifiers: *Ash, *New River(Virginia), Coal fly

An estimated 7 million liters of slightly alkaline water (pH=7.7) and ash entered New River on 23 July 1973 near Pearisburg, Virginia. The rate of dispersion, 1.4 km/hr, allowed qualitative collections of fishes and macroinvertebrates to be made immediately before and after the biological impact of the spill. Diversity and relative abundance indicated that fishes and macroinvertebrates were little affected. Physicochemical parameters from the flyash lagoon, as projected from 1971-1972 data, were within the known tolerance ranges of aquatic biota common to New River. (Katz) W77-12219

IMPACT OF AN URBAN METHOXYCHLOR SPRAYING PROGRAM ON THE ROUGE RIVER, MICHIGAN, Lafavette, Ind. Dept. of

Purdue Univ., Bionucleonics. J. F. Sullivan, and G. J. Atchison.

Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 1, p. 121-126, 1977. 1 fig,

Descriptors: *Path of pollutants, *Organic compounds, *Spraying, *Chlorinated hydrocarbon pesticides, *Plant diseases, Pathology, Toxicity, Biology, Pesticide drift, Organic pesticides, Water quality, Sampling, Analytical techniques, Water pollution, water quality, Environmental effects, Snails, Sediments, Suspended solids, Bioassay,

Identifiers: *Methoxychlor, Dutch Elm Disease, Bioaccumulation, *Rouge River(Mich) Detroit(Mich).

Methoxychlor was sprayed annually for a citywide Dutch Elm Disease control program in Detroit since 1968. The path and persistence of the pesticide in urban rivers was investigated in addition to identifying storage areas and levels of concentration. Methoxychlor was not detected by gas chromatography in any of the water, susper matter, sediment, or snail samples. No detectable levels were found in the mass spectrometric analysis of the composite samples. Explanations con cerning why no methoxychlor was found in the Rouge River ecosystem were presented. (Katz) W77-12220

FATE OF POLYCHLORINATED BIPHENYL (AROCLOR 1242) IN AN EXPERIMENTAL STUDY AND ITS SIGNIFICANCE TO THE NATURAL ENVIRONMENT,

Australian National Univ., Canberra. Dept. of

Biological Sciences. P. M. Gresshoff, H. K. Mahanty, and E. Gartner. Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p. 686-691, 1977. 2 fig,

Descriptors: *Algae, *Organic compounds, *Aroclors, *Mode of action, *Chlorinated hydrocarbon pesticides, *Growth rates, Biochemistry, Path of pollutants, Environmental effects, Population inhibition, Polychlorinated biphenyls, Laboratory tests, *Adsorption. Identifiers: Bioaccumulation, Tissue analysis,
*Aroclor 1242. Chlamydomonas reinhardi.

The fate of PCBs under experimental conditions on freshwater algae, Chlamydomonas reinharde and Chlorella fusca, was investigated. Results indicated that the major amount of Aroclor 1242 disappeared from the biological environment and became adsorbed to glass surfaces. C. reinhardi cells exhibited a full regeneration type of growth curve in the presence of PCBs. When the toxicant was removed, cells were released from their growth inhibition. C. fusca was highly sensitive to Aroclor 1242 with the inhibition prevailing even after the toxin was readsorbed onto fresh glass surfaces. Preferential binding of Aroclor to target sites was discussed. (Katz) W77-12224

EFFECTS OF HIGH STABILITY IRON-COM-PLEXES ON THE KINETICS OF IRON ACCU-MULATION AND EXCRETION IN MYTILUS EDULIS (L.), Institute of Marine Biochemistry, Aberdeen

(Scotland).

(Scotland).
S.G. George, and T. L. Coombs.
Journal of Experimental Marine Biology and Ecology, Vol. 28, p. 133-140, 1977. 3 fig, 2 tab, 19

Descriptors: *Absorbtion, *Metabolism, Animal physiology, *Mussels, *Metals, *Iron, Invertebrates, Mode of action, Aquatic life, Molluscs, Chemistry, Bioassay, Organic compounds, Path of pollutants, Biochemistry commercial shellfish. Identifiers: *Iron-complexes, Bioaccumulation,

e effects of small molecular weight complexes with a high affinity for iron on the uptake, accu-mulation, and excretion of iron by the common musulon, and exterior of from by the communion mussel, Mytilus edulis (L.) were investigated. Fe(III) complexes of citrate, EDTA, and 1,10-phenanthroline increased both the rate of uptake and the total amount accumulated when compared to those for particulate ferric hydroxide in sea water, whereas ferrichrome b and the Fe(III) complexes of aceto- and benzo-hydroxamic acids gave a decrease. Increased uptake was however, com-pensated for by an increased rate of excretion resulting in an almost constant residence time for this metal. The iron was accumulated principally in the viscera with a smaller by significant proportion in the gills. The effects produced by prior com-plexation of the iron cannot be correlated with either the strength of binding of the complex to the iron or the exchangeability of the iron with other ligands but may be concerned with the endocyto-sis, the mechanism of uptake for iron previously shown to occur in Mytilus. (Katz) W77-12228

RESIDUES OF CHLORINATED HYDROCAR-BONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS,

Institut fuer Meeresforschung, Bremerhaven

(West Germany). R. G. Schaeffer, W. Ernst, H. Goerke, and G.

Berichte der deutschen Wissenschaftlichen Kom mission fur Meeresforschung, Vol. 24 p. 225-233, 1976. 1 fig, 5 tab, 26 ref.

Descriptors: *DDD, *DDT, *DDE, *Polychlorinated biphenyls, *Pesticides, *Chlorinated hydrocarbon pesticides, *Pesticides, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Residues, Laboratory tests, Fish physiology, Food chains, Path of pollutants, Analytical techniques, Arochlor, Herrings. Identifiers: Lipid based residue concentrations, Bivalves, Polychaetes, Polyphysia, Aphrodite, Acanthocardia, Clupea, Hippoglossoides, Limanda, Gadus, *North Sea, Tissue analysis, Cod, Bioaccumulation, Cod. *DDT, *Pesticides,

Fish, polychaetes and a bivalve (altogether 8 species) from the cental North Sea were analysed for residues of DDT, DDD, DDE, PCB and HCB. Residues of PCB were predominant. Concentrations of pollutants were found in the order of 0.1 ppm wet weight in muscles of fish and up to 10 ppm in livers of cod. The values were discussed relative to lipid contents, distribution over dif-ferent tissues, increase with weight, food chain magnification and PCB/(summation DDT) ratios in different organisms. (Katz)

DISPOSITION OF DIELDRIN IN FOUR COM PONENTS OF TWO ARTIFICIAL AQUATIC SYSTEMS AND A FARM POOL.

Georgia Univ., Athens. School of Forest W. J. Lorio, J. H. Jenkins, and M. T. Huish.

Transactions of the American Fisheries Society, Vol 105, No 6, p 695-697, 1976. 4 tab, 13 ref.

Descriptors: *Dieldrin, *Organic pesticides, *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Soils, *Farm ponds, *Water quality, Fish, Ponds, Halogenated pesticides, Distribution, Aquaria, Model studies, Path of pollutants, Sedi-

Identifiers: Bioaccumulation, Accumulation, Artificial ponds, Artificial aquatic systems.

Studies of deposition of dieldrin concentrations sublethal to fish were conducted in flowing and non-flowing aquatic systems, Residual concentra-tions were determined for water, soil, plants and fish in 18 flowing and 18 static artificial systems, after treatments of 24, 36, 48, and 72 h, in a farm pond. Samples from each of the four components were analyzed for dieldrin residues by gas chromatography. Two aquaria with aerated water but without biological components were tested. The distribution of dieldrin was similar in the waters of the closed, flowing, and farm-pond systems. Soils contained little dieldrin but the compound was accumulated rapidly and as high as 474 ppb (parts per cultimated rapidly and as high as 474 ppb (parts per billion) and 3,950 ppb by plants and fish, respec-tively. The concentration of the insecticide declined with time in the three systems (soils, plants, and fish). (Katz)

ORGANOCHLORINE POISONING OF RING-BILLED GULLS IN SOUTHERN ONTARIO, Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch. For primary bibliographic entry see Field 5C. W77-12234

BEHAVIOURAL, HAEMATOLOGICAL AND HISTOLOGICAL STUDIES ON ACUTE TOXICI-TY OF BIS (TRI-N-BUTYLTIN) OXIDE ON SALMO GAIRDNERI RICHARDSON SALMO GAIRDNERI RICHARDSON TILAPIA RENDALLI BOULENGER,

Geneva Univ. (Switzerland). Department de Biologie Animale. For primary bibliographic entry see Field 5C. W77-12235

CHARACTERIZATION POLYCHLORINATED BIPHENYL DISTRIBU-TION IN THE MARINE ENVIRONMENT, Washington Univ., Seattle. Dept. of Oceanography.

For primary bibliographic entry see Field 5A. W77-12242

POLYCHLORINATED BIPHENYL INHIBITION MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA, Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station

For primary bibliographic entry see Field 5C. W77-12246

EFFECTS OF OUTBOARD MARINE ENGINE EXHAUST ON THE AQUATIC ENVIRON-

Environmental Control Corp., Ann Arbor, Mich. J. E. Schenk.

Progress in Water Technology, Vol 7, No 3/4, p 733-741, 1975. 3 tab, 17 ref.

Descriptors: *Fuels, *Oil wastes, *Water pollution sources, *Boating, *Oil pollution, *Lead, Metals, Aquatic life, Organic compounds, Path of pollutants, Toxicity, Populations, Benthos, Fish, Primary productivity, Zooplankton, Phyplankton, Sediments, Water quality.

Identifiers: *Outboard marine engine wastes, Leaded foul. Non-kended foul.

Leaded fuel, Non-leaded fuel.

With respect to the pollutional effect of outboard engines no acute effect on biological communities was observed. Species abundance, richness, and

population similarity of phytoplankton popula-tions in both the leaded and nonleaded fuel test lakes were not affected. Analysis of zooplankton and periphyton data showed no effects due to 2cycle outboard motor emmission. No marked changes in fish behavior or populations were observed. With leaded fuel increased lead levels in the water column and sediment were indicated in addition to increased hydrocarbon levels. (Klein)

ANALYSIS OF HEAVY METALS AND BAC-TERIA IN SEDIMENTS FROM DANISH LIG-NITE PITS, Copenhagen Univ. (Denmark). Inst. of Hygiene.

For primary bibliographic entry see Field 5A. W77-12250

5C. Effects Of Pollution

DAILY VERTICAL DISTRIBUTION OF ZOOPLANKTON IN SOME LAKES IN THE EASTERN PART OF THE EASTERN BOL'SHEZEMEL'SKAYA TUNDRA (IN RUS-SIAN),

Nature Conservation, Game Preserves and Hunting, Moscow (USSR). Central Lab. For primary bibliographic entry see Field 2L. W77-11501

COLD SHOCK TO AQUATIC ORGANISMS: GUIDANCE FOR POWER-PLANT SITING, DESIGN, AND OPERATION,

Oak Ridge National Lab., Tenn. Environmental

C. C. Coutant. Nuclear Safety, Vol. 18, No. 3, May-June 1977. p 329-342, 7 fig, 2 tab, 61 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, *Aquatic life, Powerplants, Cooling water, Sites, Operations, Design.

The study deals with problems which arise at son condenser cooling-water discharges of thermal power stations when warm water releases are sud-denly released. The biological basis for cold shock damages is discussed and guidance recommendations for siting, design and operation of power plants is suggested. It is suggested that siting sta-tions away from zones of high biological activity may be the best way to prevent cold shock damages. Three principal design options which are recommended are: (1) restricting the volume of warmed water accessible to organisms, (2) reducwarmed water accessione to organisms, (2) returning the frequency of complete shutdown through multiple-unit designs, and (3) reducing the temperature differences of the discharge to the ambient temperature. Operation of plants within the design bases is recommended. (Chilton-ORNL)

EFFECTS OF STABLE CHLORINE-CONTAIN-ING ORGANICS ON AQUATIC ENVIRON-

Oak Ridge National Lab., Tenn. Environmental Sciences Div. C. W. Gehrs, L. D. Eyman, R. J. Jolley, and J. E.

Nature, Vol. 249, No. 5458, June 1974, p 675-676. 10 ref.

Descriptors: *Environmental effects, *Water pol-lution effects, *Organic compounds, *Chlorine, Aquatic environment, Hatching, Eggs, Carp.

Data on the toxic effects of two species of stable chlorine-containing organic compounds, 4-chlororesorcinol and 5-chlorouracil, on the hatchability of carp eggs is reported. Tests were run on water-hardened and non-water-hardened eggs at temperatures of 21 and 26 C and concentrations ranging from 0.001 to 10 mg l (minus 1) plus con-

Group 5C-Effects Of Pollution

trols. Comparison of the relative toxicity of the two chemicals on non-water-hardened eggs at the two temperatures indicated similar toxicity, with the lower concentration significantly lowering hatchability in all but the 26 C 5-chlorouracil test medium. Eggs that were water-hardened before exposure to the toxicants were more resistant to the toxicants than were non-water-hardened eggs. (Chilton-ORNL) W77-11503

PARTITIONING OF POLYCYCLIC AROMATIC HYDROCARBONS BETWEEN DISSOLVED AND PARTICULATE PHASES IN NATURAL

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

For primary bibliographic entry see Field 5B. W77-11504

A YEARLY CYCLE OF CHANGES IN DYNAMICS OF PRODUCTION OF THE CHEMOAUTOTROPHIC BACTERIA IN BOTTOM SEDI-AUTRUPHIC BACTERIA IN BOTTOM SEDI-MENTS OF A WATER BODY, Polish Academy of Sciences, Warsaw. Inst. of Ex-perimental Biology. E. Fischer.

Pol Arch Hydrobiol. 19(4), p 343-359, 1972.

Descriptors: *Bacteria, *Bottom sediments, Productivity, *Ponds, Carbon compounds, Seasonal, Temperature. Carbon-14, *Poland. Identifiers: *Chemoautrophic bacteria.

The dynamics of a yearly cycle of the chemoautotrophic bacterial production in the bottom sedi-ments of 2 small water bodies was studied. These were a natural pond situated in the area of Kampinos Forest (Poland) and an experimental reservoir situated on the premises of the Institute of Experimental Biology, Polish Academy of Sciences. The 24 h assimilation of C absorbed in the process of chemoautotrophic bacterial produc-tion was determined using labelled carbon 14C and the density of bacterial population determined by direct microscopic counting. Based on those 2 determinations, production dynamics of bacterial population in the autotrophic bacterial biomass production were estimated. This value was expressed in microgram of assimilated C/million bacterial cells. The production dynamics of the chemoautotrophic bacteria show the highest number of bacteria, the production dynamics are low, which is concurrent with a small amount of produced biomass. Factors determining the number of bacteria in small water bodies are different from those influencing production dynamics. The low number of bacteria at the high production activity in summer means the bacterial ass turnover in the water biocenosis is high at this time contrary to the winter season where the situation is inverted. The variability of the 24 h chemoautotrophic bacterial production level is related to the variability of the production activity in such an essential manner that the seasonal variability of both those values is of a very similar character. The level of the chemoautotrophic bac-terial biomass production is dependent, above all, on those factors which effect the efficiency of that production, while the effect of the abundance of bacterial cells is apparent only in sporadic cases. The computed coefficient of biomass production shows some characteristic regularities in relationship to temperature of the environment and the CO2 contents, which means that this coefficient really determines the activity of the chemoautotrophic production of bacterial population in the bottom sediments.—Copyright 1974, Biological Abstracts, Inc. W77-11505

THE INTENSIVE PRODUCTION OF FRESH WATER ALGAE, (IN DUTCH), Ghent Rijksuniversiteit (Belgium). Faculteit Landbouwwetenschappen.

J. De Maeseneer. Meded Fac Landbouwwet Rijksuniv Gent. 37(4), p 1201-1209, 1972.

Descriptors: *Algae, *Productivity, *Diatoms, Climates, *Eutrophication, Food chains, Nutrients, Trophic level. Identifiers: Milkfish, Taiwan.

The technical means for raising large quantities of algae, either in biologically purified or in unpurified water are today within reach. However, with ritied water are today within reach. However, with the algae now being used a continuous production set-up is impossible in moderate climates. On the basis of limnologic observations in shallow eutrophic water, the view is expressed that diatomacea could well be the missing link for continuous production. Nothing is known about the nutritional value of diatomacea for the higher animals. It is a fact, however, that diatomacea, both in see, water and fresh water are the basis for both in sea water and fresh water, are the basis for a high trophic pyramid. This cannot be said of the blue algae. In Taiwan the growth of diatomacea in milk-fresh ponds is encouraged by the addition of sodium silicate whenever the SiO2 content of the water drops below 0.25 ppm.—Copyright 1974, Biological Abstracts, Inc. W77-11506

THE ACCUMULATION OF MERCURY BY THE THORNBACK RAY, RAJA CLAVATA L., Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological R. J. Pentreath

Journal of Experimental Marine Biology and Ecology, Vol. 25, No. 2, 1976, p 131-140. 4 fig, 6 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution effects, Radiobiology, *Mercury, Absorption, Food, Sea water, Organic compounds, Inorganic compounds. Identifiers: *Methyl mercury, Thornback ray.

Experiments showed that the ray is capable of obtaining inorganic mercury from both food and sea water. Input from sea water at 20 ng Hg/l was cal-culated as approximately 0.18 ng Hg/g of fish/day. Food containing approximately 35 ng/g of inorganic mercury at a feeding rate of 5% body weight/day resulted in an intake of 1.75 ng Hg/g of fish/day. 14% of this oral intake was retained. Accumulation of methylmercury from sea water was greater than that of the inorganic form and no excretion was observed. Methyl mercury distribution within the fish is similar to that of the stable mercury, and it has a relatively long biological half-life so that a total body content of approximately 1100 ng Hg could be maintained with an intake rate of 2 to 3 ng Hg/day. Concentration factor of mercury over sea water per unit time was found to be much greater for the ray than the plaice. (Chilton-ORNL) W77-11507

THE ACCUMULATION OF MERCURY FROM FOOD BY THE PLAICE, PLEURONECTES PLATESSA L., Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

R. J. Pentreath.

Journal of Experimental Marine Biology and Ecology, Vol. 25, No. 1, November 1976, p 51-65. 7 fig, 5 tab, 31 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Mercury, Absorption, Sea water, Organic compounds, Inorganic compounds, Radiobiology. Identifiers: *Plaice, *Methyl mercury.

Inorganic and organic mercury accumulation was studied by forcibly feeding Hg203-labelled food. Methyl mercury was found to be readily absorbed

and only slowly eliminated. Five days after ingestion, approximately 30% of the organic form was associated with muscle, skin and bone tissue. It was suggested that inorganic mercury may be accumulated both by ingestion and through the gill and skin from sea water. It was concluded that the preferential absorption of the methyl form and its longer biological half-time, would result both in an increased percentage of methyl mercury at the higher trophic levels and a higher total mercury concentration. (Chilton-ORNL) W77-11508

ACTIVITY OF HYDROLYTIC ENZYMES IN WATER AND BIOMASS OF PLANKTONIC OR-GANISMS IN A RESERVOIR OF AN EUTROPHIC TYPE IN THE LAGOON OF KUR-SIU MARIOS, (IN RUSSIAN), Akademiya Nauk Litovskoi, SSR, Vilnius. Inst. of

V. Yu. Gribauskene, M. M. Yamontene, and K. K.

Yankyavichyus

Liet Tsr Moksiu Akad Darbai Ser C. 2, p 3-7, 1973.

Descriptors: *Enzymes, *Biomass, Eutrophica-tion, *Plankton, Reservoirs, Lagoons, *Proteins,

Identifiers: Amylases, Cellulases, Lithuania, Pec-tinases, Proteases, *USSR(Lagoon of Kursiu

Activity dynamics of hydrolytic enzymes (those of amylases cellulases, proteases, pectinases) and a general amount of protein substances were investigated in the water of the Lagoon and in the biomass of planktonic organisms at the 2 Lagoon stations near Juodkrante (Lithuania, USSR) from June-Sept. 1970. Considerable fluctuations of the amount of protein substances and the activity of endogenic and exogenous enzyme were determined. Two activity maxima were revealed: the 1st one from July 6-20 and the 2nd one from Aug. 17-Sept. 14. No essential difference in indices of the activity of hydrolytic enzymes and the amount of protein substances at both stations was detected.—Copyright 1974, Biological Abstracts, Inc. W77-11509

HEAVY METALS IN WATER, SEDIMENTS, AND CHIRONOMIDS, TECHRAD, Inc., Oklahoma City, Okla For primary bibliographic entry see Field 5B. W77-11510

THE BIOMASS, ORGANIC MATTER CONTENTS AND CALORIFIC VALUES OF MACROPHYTES IN THE LAKES OF THE SZESZUPA DRAINAGE AREA, Polish Academy of Sciences, Mikolajki (Poland). Dept. of Applied Limnology.

A. Garbowski.

Pol Arch Hydrobiol. 20(2), p 269-282, 1973.

Descriptors: *Biomass, *Organic matter, Lakes, Drainage, Aquatic plants.

Identifiers: *Caloric value, Chara-sp, Dicots, Equisetum-limosum, *Macrophytes, Monocots, *Poland(Szeszupa drainage area).

The biomass, organic matter content and caloric rate biomass, organic mater contains and carvalues were measured in macrophytes living in the littoral of the lakes of the Szeszupa drainage area (the Suwalki-Augustow Lakeland (Poland)). Fourteen lakes of different trophic types were investigated. It was found that macrophyte biomass per I m2 of the littoral area in the investigated lakes was from 326.5-979.0 g/m2. The highest share in the total biomass was that of emergent plants, 87.85 on the average, and the lowest one, that of floating plants, 0.7%. The highest organic matter content was that of emergent plants, 3621 cal/g, submerged plants with floating leaves, 3140 cal/g, submerged plants, 1710 cal/g, and floating plants, 1526 cal/g, dry weight. Caloric values of organic matter were calculated for the particular macrophyte species (monocots, dicots Equisetum limosum Chara sp.) as well as for the ecological plant groups. The caloric value per area unit of the littoral was also estimated--Copyright 1974, Biological Abstracts, Inc.

RETENTION OF A SINGLE ORAL DOSE OF CADMIUM IN TISSUES OF THE SOFTSHELL TURTLE, TRIONYX SPINIFER, Middle Tennessee State Univ., Murfreesboro,

Tenn. Dept. of Biology. K. M. Robinson, and M. R. Wells.

Bulletin of Environmental Contamination and Toxicology, Vol 14, No 6, December 1975, p 750-752. 1 tab, 6 ref.

Descriptors: Environmental effects, *Water pollution effects, Sewage effluents, *Cadmium, *Absorption.
Identifiers: Single dose.

Softshell turtles were collected from Stones River. Cannon County, Tennessee. The turtles were feed 2 mg of cadmium as cadmium acctate and then dissected at 48 and 96 hours after dosing. Analysis of liver, kidney, stomach, small intestine, and large intestine showed these tissues to be free of cadmium. In turtles collected from the same river at a site downstream from a sewage effluent, cadmium was detected with levels ranging from 9.87 ppm in the kidney to 0.19 ppm in the small intestine. It was concluded that the softshell turtle is able to tolerate relatively large concentrations of cadmi-um initially and over long periods of time with lit-tle effect on the health of the turtles. (Chilton-W77-11513

EFFECTS OF DISSOLVED OXYGEN ON SUR-VIVAL AND BEHAVIOR OF SELECTED FISHES OF WESTERN LAKE ERIE,

Tennessee Game and Fish Commission, Nashville.

Bull Ohio Biol Surv. 4(4), p 1-76, 1973.

Descriptors: *Dissolved oxygen, *Fish behavior, *Mortality, *Lake Erie, Great Lakes, *Anaerobic , Bass perch, Bluegill, Walleye, Lethal conditions limit. Fish diets.

Identifiers: Esox-lucius, Lepomis-macrochirus, Micropterus-salmoides, Stizostedion-vitreum-vitreum. Perca-flavescens,

This study was initiated following upon the discovery that the bottom waters of Lake Erie (USA and Canada) were becoming increasingly anaerobic due to pollution. The following species of fish were studied: norther pike (Esox lucius), largemouth bass (Micropterus salmoides), bluegill (Lepomis macrochirus), walleye (Stizostedion vitreum vitreum), and yellow perch (Perca flavescens). The dissolved O2 content of lake water was reduced mechanically and delivered in continuous flow through aquaria. In the test aquaria a layer of liquid paraffin on the water sur-face eliminated measureable exchange of oxygen between the water and the air. All of the fish used in the tests were young-of-the-year. Test series were started at 5 ppm dissolved O2 and the concentation lowered in 1 ppm steps until lethal levels were reached. Control aquaria were maintained at 6 ppm. All fish responded to all tested O2 concentrations below 6 ppm with increased at the concentration of t trations below 6 ppm with increased rates and am-plitudes of opercular movements. Activity rates were variable but generally decreased as th concentration was approached. Both single and small groups (4-6) of fish were tested and grouped small groups (4-6) of fish were tested and grouped fish, as a rule, showed lower rates of opercular movement than single fish. Stress phenomena, such as bleaching, cessation of feeding and loss of equilibrium, were noted in all species tested. Most of the fish were tested at bout 22C but 1 series of tests were run on the yellow perch at 15C. Lethal concentrations for northern pike, largemouth bass, bluegill and yellow perch (at 22C) was 1 ppm.

Walleyes died at 2 ppm but apparently from internal injuries and not from asphyxia. The lethal con-centration for yellow perch at 15C was not deter-mined. Bluegills took longer to succumb to 1 ppm dissolved O2 than the other species tested. All concentrations of dissolved O2 below 6 ppm are probably ecologically unfavorable.—Copyright 1974, Biological Abstracts, Inc. W77-11514

METHYLMERCURY IN THE ENVIRONMENT: A REVIEW OF CURRENT UNDERSTANDING, Duke Univ. Medical Center, Durham, N.C. Dept. of Community Health Sciences.

W. Stopford, and L. J. Goldwater.

Environmental Health Perspectives, Vol 12, 1975. p 115-118. 39 ref.

Descriptors: *Environmental effects, *Water pol-lution effects, Public health, Mercury, Toxicity, Food chains, Aquatic environment, Sediments, Reviews.

Identifiers: *Methylmercury.

Some of the more important findings in the area of methylmercury poisoning are summarized. The danger of methylmercury poisoning is reported to be slight when the environment is not directly conated with methylmercury. Mercury is bound by sediments and its availability to aquatic organisms is decreased. Sediments have also shown a greater propensity to demethylate than to methylate mercury. Methylmercury and inorganic mer cury concentrations in noncontaminated aquatic ecosystems were found to be lower than those that have been found to cause toxicity even in the most sensitive organisms. Protein bound methylmercury appears to be less toxic than methylmercury salts. Selenium present in this protein appears to be a detoxifying agent for methylmercury. (Chilton-ORNL) W77-11516

POLYAMINE SYNTHESIS IN LIVER AND KID-NEY OF FLOUNDER IN RESPONSE TO METHYLMERCURY,

Arizona Univ. Medical Center, Tucson. Dept. of Pharmacology.

C. A. Manen, B. Schmidt-Nielsen, and D. H. Russell

American Journal of Physiology, Vol 231, No 2, August 1976, p 560-564. 4 fig, 2 tab, 28 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Mercury, Toxicity, Fish.
Identifiers: *Flounder, Polyamine, Synthesis,
Liver, Kidney, *Methylmercury.

Winter flounder, Pseudopleuronectes americanus were administered methylmercury at the rate of 2 mg/kg in 0.85% saline. Within 2 h of treatment, the ntration of mercury in the kidney had risen from less than 1 ppm to greater than 30 ppm. This level was maintained for 16 h, after which it declined until a level of 3 ppm was reached at 72 h. Five and sevenfold elevations of ornithine decarboxylase activity occurred in the kidney and liver within 45 and 15 h, respectively, from single injections of methylmercury. 1.5 fold elevations of putrescine- and spermidine-stimulated S-adenosylnethionine decarboxylase activities were observed in both tissues. Concentrations of all three polyamines increased in the liver for 48 h and then polyamnes increased in the liver for 48 and the declined. Putrescine concentration in the kidney increased to 200% of control at 72 h and then declined. Spermidine concetration decreased throughout the time studied to 17% of control at 1 wk. Spermine concentration did not change significantly throughout the time studied. (Chilton-ORNL) W77-11518

DISTRIBUTION OF CADMIUM, ZINC AND COPPER IN THE MUSSEL MYTILUS EDULIS.
EXISTENCE OF CADMIUM-BINDING PROTEINS SIMILAR METAL-

LOTHIONEINS, Liege Univ. (Belgium). Laboratoire de Biologie Generale; and Liege Univ. (Belgium). Laboratoi d'Oceanologie. F. Noel-Lambot

Experientia, Vol 32, No 3, p 324-326. 2 fig, 15 ref,

Descriptors: Environmental effects, *Water pollu-tion sources, Heavy metals, *Cadmium, *Zinc, *Copper, *Mussels, Mollusks, Absorption. Identifiers: Cadmium-binding proteins, Metal-

The soft tissues of mussels were analyzed for Cd, Zn, and Cu. The results showed that Zn and Cu are generally associated with high molecular weight proteins. Cadmium accumulated by mussels dur-ing chronic intoxications induces the synthesis of low molecular weight Cd-binding proteins (Cd-BP) in tissues. This Cd-BP possesses a high percentage of cysteine and an ultraviolet absorption spectrum typical of metallothioneins. THe existence of such oteins in molluscs would allow them to accumulate large amounts of Cd and to resist it, thus becoming a potential danger to man as food. (Chilton-ORNL) W77-11519

TRACE ELEMENTS IN ACARTIA CLAUSI FROM ELEFSIS BAY OF THE UPPER SARONIKOS GULF, GREECE, Democritus Nuclear Research Center, Athens

Democritus Nuclear Research Center, Amens (Greece). Chemistry Dept. D. Zafiropoulos, and A. P. Grimanis. Marine Pollution Bulletin, Vol 8, No 4, April 1977, p 79-81. I fig., 3 tab, 12 ref.

Descriptors: *Environmental effects, *Water pol-lution effects, Industrial wastes, Sewage ef-fluents, *Trace elements, Zooplankton, An-timony, Arsenic, Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Mercury, Scandium, Selenium, Zinc.

Identifiers: Elefsis Bay, *Saronikos Gulf(Greece), *Acartia clausi.

Neutron activation analysis was used to determine antimony, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, mercury, scandium, selenium and zinc in zooplankton samples. The bay from which samples were collected receives effluents from at least 25 large industries as well as domestic sewage. Samples taken in January 1974 showed elevated concentrations for As, Co, Cu, Fe, Mn, Sb, Sc, Se, and Zn compared to con trations found in samples taken a month later. For Hg no significant differences were found between two cruises whereas for Cd and Cr samples taken during a second cruise show higher concentra-tions. Lower values of Co, similar values of Fe and slightly increased values of Cr were found in Elefsis Bay Acartia clausi than those reported for Acartia clausi in the Bay of Roquebrune. It is suggested that species composition and environmen-tal factors may account for the differences between trace element concentration found in this study and those reported in the literature. (Chilton-W77-11521

EFFECT OF TETRAMETHYL LEAD ON FRESHWATER GREEN ALGAE, Canada Centre for Inland Waters, Burlington

(Ontario).

(Ontano).

B. A. Silverberg, P. T. S. Wong, and Y. K. Chau.

Archives of Environmental Contamination and
Toxicology, Vol 5, 1977, p 305-313. 4 fig, 1 tab, 13

Descriptors: *Environmental effects, *Water pol-lution effects, *Lead, Algae, Photosynthesis, Growth rates, *Chlorophyta. Identifiers: *Tetramethyl lead.

Group 5C-Effects Of Pollution

The effect of tetramethyl lead on growth and photosynthesis of three species of algae (Chlorell pyrenoidosa, Scenedesmus quadricauda, and Ankistrodesmus falcatus) was studied by passing tetramethyl lead into a culture medium containing the test algae. Even though less than 0.5 mg of Pb were passed through the culture medium, it was found that primary productivity and cell growth decreased by 85 and 32% respectively. It was concluded that tetramethyl lead exposure results in Pb ions penetrating the cell and being deposited within concretion bodies which are similar to polyphosphate inclusions commonly found in the lgae. Polyphosphate may be suspected as one of the substances contributing to binding of lead ions. Tetramethyl lead toxicity manifests itself by loss of the algal's physiological and structural integrity. (Chilton-ORNL)
W77-11522

EFFECTS OF DREDGING OPERATIONS ON ESTUARINE BENTHIC MACROFAUNA, Swedish Water and Air Pollution Research Lab.

Goteborg. Marine Pollution Bulletin, Vol 8, No 5, May 1977, p 102-104. 4 fig, 8 ref.

Descriptors: *Environmental effects, *Dredging, *Benthic fauna, Estuaries, Populations, Water pollution effects, *Estuarine environment. Identifiers: Sweden.

The number and diversity of benthic species were found to be reduced by dredging operations. Larval recruitment in the vicinity of the dredged area was also affected. Benthic fauna showed an increase in mercury, cadmium, zinc, copper, lead and nickel concentrations. Community structure appeared to be nearly restored and heavy metal concentration decreased one and a half years after termination of dredging. It was concluded that the primary effects of the dredging operations were due to the increased amount of suspended particles. Higher concentrations of trace elements found in deposit feeders as compared to filter feeders were thought to be a result of the components being associated with detritus particles and ingested by deposit feeders. (Chilton-ORNL) W77-11525

CADMIUM AND ZINC TOXICITY TO FLAG-FISH, JORDANELLA FLORIDAE, Environmental Research Lab.-Duluth, Minn.

R. L. Spehar. Journal of the Fisheries Research Board of Canada, Vol 33, No 9, September 1976, p 1939-1945. 1 fig, 3 tab, 22 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Cadmium, *Zinc, Fish, Absorption, Mortality, Reproduction, Growth rates, Fry, Larvae, Embryonic growth stage, Mature growth

stage. Identifiers: *Flagfish.

Response of flagfish to cadmium and zinc was measured on the basis of 96-h median lethal concentrations and significant decreases in survival, growth and reproduction. Spawning and embryo production were the most sensitive measures of effect. For zinc tests, survival of larvae and adult growth were adversely affected at lower concentrations than those affecting reproduction. Larvae previously exposed to cadmium and zinc as emb ryos were more tolerant than those not previously exposed. This effect was more pronounced in zinc tests. 96-h LC50 values for both cadmium and zinc to juvenile fish were 2500 and 1500 microg/liter, respectively. Fish exposed to concentrations as low as 1.7 microg/l of cadmium were seen to accumulate significant amounts of the metal. Significant amounts of zinc were accumulated by fish exposed to concentrations of 47 microg/l. (Chilton-ORNL) W77-11526

TOXIC INTERACTION OF MIXTURES OF TWO COAL CONVERSION EFFLUENT COM-PONENTS (RESORCINOL AND 6-METHYLQUINOLINE) TO DAPHNIA MAGNA, Oak Ridge National Lab., Tenn. Environmental Sciences Div.

S. E. Herbes, and J. J. Beuachamp.

Bulletin of Environmental Contamination and Toxicology, Vol 17, No 1, 1977, p 25-32. 1 fig, 4 tab, 18 ref.

Descriptors: Environmental effects, *Water pollu-tion effects, *Toxicity, Organic compounds, Daphnia, Plankton, Effluents. Identifiers: *Resorcinol, *Methylquioline, Coal

Daphnia were incubated in test solutions of resor-cinol and 6-methylquinoline, both individually and in mixtures. Mixtures of resorcinol and 6-methylquinoline were found to be less toxic than either pure compound tested alone. These results contrast with most earlier studies of toxic mixtures, which have generally demonstrated additive interaction between aqueous pollutants. Most earlier studies examined effects of inorganic compound mixtures or highly-similar organic com-pounds while the present study has dealt with two dissimilar organic contaminants. It was concluded that the present work indicates that addition of fractional toxicities may produce substantial errors in prediction of toxicity of mixtures of non-ORNL) organic components. (Chilton-W77-11528

THE TOXIC EFFECTS OF SELECTED HEAVY METALS ON UNADAPTED POPULATIONS OF VOTICELLA CONVALLARIA VAR SIMILIS, Surrey Univ., Guildford (England). Dept. of Microbiology.

E. P. Sartory, and B. J. Lloyd. Water Research, Vol 10, 1976, p 1123-1127. 1 fig, 2

tab. 10 ref.

Descriptors: *Environmental effects, *Water polhttion effects, *Heavy metals, Lead, Mercury, Zinc, *Protozoa, Invertebrates, Aquatic life, Adaptation, Mortality, *Toxicity. Identifiers: *Vorticella convallaria var similis.

Unadapted populations of the protozoan Vorticel-la convallaria var similis which is normally found in healthy rivers, activated sludge, percolating filters and slow sand filters were exposed to a range of concentrations of lead, mercury and zinc. It was found that the unadapted protozoan is sensitive to concentrations of lead and mercury as low as 0.0005 mg/l of the free metal ion/l, but will grow in the presence of 0.0002 mg/l or less of either of these metals. It is sensitive to concentrations of zinc as low as 0.075 mg of the free metal ion/l but will grow as 0.075 mg of the free metal folial out-will grow in the presence of 0.05 mg/l or less. Sur-vival in the presence of high concentrations of heavy metals was concluded to depend upon the degree of adaptation. (Chilton-ORNL) W77-11529

DISTRIBUTION OF PLUTONIUM-237 IN A LIT-TORAL FRESHWATER MICROCOSM, Oak Ridge National Lab., Tenn. Environm Sciences Div

For primary bibliographic entry see Field 5B. W77-11530

OCCURRENCE OF SMALL METAZOA IN DECOMPOSITION PROCESSES FROM A COM-PARATIVE VIEWPOINT (SEWAGE FILTERS, PATTERN EXPERIMENTS), (IN GERMAN),

Sitzungsber Oesterr Akad Wiss Math-Naturwiss Kl. 179(7), p 129-158, 1971.

Descriptors: *Nematodes, *Rotifers, Invertebrates, *Sewage, *Filters, *Protozoa,

Copepods, Nitrates, Phosphates, Ammonium salts, *Biodegradation, Oligochaetes.

Identifiers: *Bdelloidea, *Flagellates, *Metazoa, Pattern experiments.

In both sewage filter and pattern experiments, Nematoda and Rotifera occurred; Bdelloidea were especially abundant. Many oligochaetes appeared in the filter, most of which were probably con-nected with the decomposition cycle. Copepoda were also evident in filters and oxidation trenches with a light flow volume. Nitrate, ammonium salt and phosphate were added to sewer waters; Ne-matoda flourished in the nitrogenous milieu and matoda Hourished in the nitrogenous milieu and Rotifera thrived on phosphate. Nematoda usually appeared immediately after the initial flagellate-ciliate (protozoa) colonies, whereas Rotifera accompanied later decomposition. Nematoda reached maximum development after 20 days in a concentration of 84 mg KMnO4/l and Rotifera reached, a maximum efter 41 days of the colonies. reached a maximum after 43 days at 58 mg KMnO4/l. Average KMnO4 consumption was 70 mg/l on the surface (80-100 mg/l in the winter), 64 mg/l at a depth of 1.5 m and 44 mg/l at a greater (unspecified) depth. Copyright 1974, Biological Abstracts, Inc. W77-11532

LAKES SORELL AND CRESCENT - A TASMANIAN PARADOX,

New South Wales Inst. of Tech., Broadway (Australia). School of Life Sciences. D. M. H. Cheng, and P. A. Tyler. Int Rev Gesamten Hydrobiol. 58(3), p 307-343,

Descriptors: *Eutrophication, Lanco,
Biomass, Climates, Phytoplankton, Salinity,
Seasonal, Soils, Vegetation, *Mesothrophy.

**Table Scapil/Tasmania), *Lake Identifiers: *Lake Sorell(Tasmania), Crescent(Tasmania).

Lakes Sorell and Crescent are closely adjacent shallow lakes on the Tasmanian Central Plateau, Australia. They have similar morphometry and similar climate, geology, soils and vegetation in their catchments. They are polymictic, oxygen-saturated and colorless but turbid. They have soft water with major ions Na, Ca, Mg, Cl, HCO3 present in almost equi-ionic quantities and a slightly alkaline reaction. Chemically they are alike, the major difference being a 20% higher salinity in Crescent from 1967-69. During 1969-71 neavy rains reduced this difference. ently flows from Sorell to Crescent in any year. Despite these similarities their phytoplank-ton populations differ markedly in every respectspecies composition, population structure, popula-tion stability and total biomass. Lake Crescent has a standing crop 10 X that of Sorell. The former is eutrophic, the latter mesotrophic. Well marked seasonal cycles do not occur but sporadic fluctuations of biomass are brought about by hydrologic or other events. The pronounced differences in every aspect of plankton populations in 2 similar and connected lakes cannot yet be explained. They remain a limnological paradox. Copyright 1974, Biological Abstracts, Inc. W77-11534

VITAMIN B12 CONTENTS IN SEA WATER ALONG THE COAST OF FUKUYAMA IN 1970 AND 1971, Hiroshima Univ. (Japan). Dept. of Fisheries.

A. Inoue, H. Koyama, and S. Asakav J Fac Fish Anim Husb Hiroshima Univ. 12(1), p 13-20, 1973.

Descriptors: Vitamins, *Vitamin B, Bioassay, Sea water, *Eutrophication, Coasts, *Phytoplankton, Red tide, Seasonal, Temperature. Identifiers: Eutreptiella sp, Fukuyama, Gymnodinium sp, Heterosigma sp, Japan, Lactobacilus leichmanni, Vitamin B-12, *Seto Island Sea(Jaea).

In the nearshore region of the Seto Inland Sea off Fukuyama (Japan), where red water blooms of phytoplankton frequently occur, the vitamin B12 content of the sea water was determined at nearly monthly intervals except in winter during 1970 and 1971. Water samples were taken from a depth of 2m. The vitamin B12 content of the sample water filtered through a membrane filter was determined by the microbiological assay depending on Lac-tobacillus leichmanii. Vitamin B12 was detected in all the samples. Its concentration varied between 0.42 and 6.43 micrograms/l. The vitamin B12 content was not conspicuously low in the sea water samples taken within red water blooms (of Heterosigma sp., Gymnodinium sp. Eutreptiella sp.). Though its seasonal variation was not concuous, it was generally high in the months of spicuous, it was generally high in the monus of high water temperatures (about 18C or above); the maximum occurred in June or July when the chlorinity of sea water dropped due to the rainy season; a secondary maximum occurred in Sept. or Oct. At the station most distant from the river mouth (viz., 6 km) the sea water showed somewhat lower contents of vitamin B12 than at other stations. Besides the river drainage, the botom mud was also considered as source of vitamin B12 supply. In the present waters the fluctuation and succession of phytoplankton blooms took place during warm months. It does not seem probable, however, that these phenomena were controlled by any paucity of vitamin B12, because the latter was present in these months usually in concentrations of 2 micrograms/l or above, which is sufficient to grow some of the vitamin B12 requiring plankters to a population density of about 105 cells/ml. Copyright 1974, Biological Abstracts, Inc. W77-11535

METHYLMERCURY: TERATOGENIC AND LETHAL EFFECTS IN FROG EMBRYOS, Indiana State Univ., Terre Haute. Dept. of Life Sciences

N. A. Dial. Teratology, Vol 13, No 3, June 1976, p 327-334. 5 fig, 1 tab, 15 ref.

Descriptors: Environmental effects, *Toxicity, *Mercury, *Embryonic growth stage, *Frogs, Mortality, *Lethal limit. Identifiers: *Methylmercury *Teratogenesis.

The experiments reported indicated that trace amounts of methylmercuric chloride (MMC) can cause death or serious defects in early frog development. Death and severe defects occurred over a rather narrow range of concentration and increased with exposure time and increasing concentration levels. Treatment at the blastula, gastrula, and neural-plate stages with 5 ppb showed only minor effects; 10, 15, and 20 ppb produced such defects as exogastrulae, poor tail develop-ment, and poor general development as well as increased death rates related to exposure time and concentration; at 30 ppb embryos showed a high frequency of defects after 24 hours and all died by end of the third day. Individual tolerances to methylmercury were observed in all stages treated. (Chilton-ORNL) W77-11536

UPTAKE OF ZINC, LEAD, AND CADMIUM BY YOUNG WHITING IN THE SEVERN ESTUARY, Bath Univ. (England).

Marine Pollution Bulletin, Vol 8, No 7, July 1977, p 164-166. I fig, 1 tab, 8 ref.

Descriptors: Environmental effects, *Water pollution effects, *Zinc, *Lead, *Cadmium, Estuaries, Fish, *Absorption.
Identifiers: *Severn Estuary, *Whiting.

Whiting were collected from the cooling water in-takes of Oldbury on Severn nuclear power station

during 1975-1976. Highest levels of zinc were found in November (102 ppm) but these fell in December (79 ppm) and concentrations remained relatively constant. Lead and cadmium levels rose gradually from December to March after an initial fall in both elements from November to December. It was concluded that once zinc accutissues maintain this level by rejecting excess zinc. Cadmium and lead, once ingested, may not be rejected so easily and slowly increase. (Chilton-ORNL) W77-11537

THE POTENTIAL TOXICITY AND BIOACCU-MULATION IN AQUATIC SYSTEMS OF TRACE ELEMENTS PRESENT IN AQUEOUS COAL CONVERSION EFFLUENTS, Oak Ridge National Lab., Tenn. Environmental

Sciences Div. S. G. Hildebrand, R. M. Cushman, and J. A.

Reprinted from Trace Substances in Environmental Health-X. 1976. A symposium held at the University of Missouri, Columbia, D. D. Hemphill, Ed. p 305-313, 3 tab, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, *Trace elements, Effluents, *Toxicity, *Adsorption. Identifiers: Coal conversion, *Bioaccumulation.

Results of analyses for 55 elements in aqueous effluents of a single experimental run of a coal conversion pilot plant are presented. Measurable quantities of 23 of these elements were detected in the dryer stage liquor and 30 elements in the product separator liquor. For the majority of ele-ments detected, higher concentrations were observed in the product separator liquor. A literature review on the toxicity and bioaccumulation factors for aquatic biota of these 55 elements is summarized. It is emphasized that any actual assessment of the impact of trace element releases will have to be site-specific, as the chemical and biological characteristics of receiving waters will affect the toxicity and bioaccumulation of many

RADIOISOTOPE TECHNIQUES IN DELINEA-TION OF THE ENVIRONMENTAL BEHAVIOR OF CADMIUM.

elements. (Chilton-ORNL) W77-11540

Oak Ridge National Lab., Tenn. Environmental Sciences Div. For primary bibliographic entry see Field 5B. W77-11541

EFFECTS OF SIMULATED RAIN ACIDIFIED WITH SULFURIC ACID ON HOST-PARASITE

INTERACTIONS, Oak Ridge National Lab., Tenn. Environmental Sciences Div. D. S. Shriner.

Water, Air, and Soil Pollution, Vol 8, 1977. p 9-14.

Descriptors: *Environmental effects, *Simulated rainfall, *Acidic water, Hosts, Diseases, Parasitism, Sulfuric acid, Vegetation. Identifiers: *Host-parasite interactions

Five host-parasite systems were investigated. Sig-nificant inhibition of some parameter of disease development occurred in three of these cases. Production of telia of the fusiform rust organism (Cronartium fusiforme) on the host willow oak (Quercus phellos) was inhibited by 86%; reproduction of a root-knot nematode (Meloidogyne hapla) on field-gron kidney beans was inhibited by 66%; there was a delay in the development of a bean rust (Uromyces phaseoli) epidemic on field-grown kidney beans which was evident after seven weeks but not after nine weeks. A difference was noted in nodulation of the kidney bean plants by the

symbiotic nitrogen-fixing bacteria of the genus Rhizobium. Effects on halo blight of kidney beans depended upon the segment of the disease cycle in which the acidic treatment occurred. It was concluded that there is a need for study of the con-sequences of prolonged exposure of both agronomic and natural ecosystems to the influences of acidic precipitation. (Chilton-ORNL) W77-11542

HEAVY METAL ENRICHMENT IN MINE DRAINAGE 2. THE WITWATERSRAND GOLD-FIELDS, Pretoria Univ. (South Africa). Dept. of Chemistry.

G. T. Wittmann, and U. Forstner. South African Journal of Science, Vol 72, No 12, p 365-370, December 1976. 2 maps, 2 tab, 31 ref.

Descriptors: *Heavy metals, *Mine drainage, Sediments, Water analysis, Toxins, Mercury, Mine wastes, Water pollution, Leaching, Seepage, Spectroscopy, X-ray diffraction, Clays, Hydrogen ion concentration.

Identifiers: Witwatersrand, Klip River, Mooiriversloop, Natalspruit, Elsburgspruit, Rietspuit, Blesbokspruit, South Africa.

By the end of 1972, a cumulative total of 31 046 625.9 kg gold had been produced from approximately 3 150 000 000 tonnes of auriferous ore milled. The main residues from goldmining opera-tions consist of waste rock, cyanided sand and slimes, and surplus underground water (100 000 t/day). the slimes dams are also used for the disposal of other effluents, such as discarded cyanide solutions and sulphuric acid. The disposal of cyanide solution or inadvertent spillage is not re-garded as being hazardous due to the low cyanide concentrations (<0.010% KCN) and the rapid decomposition to values below 0.001% within 24-36 h from atmospheric exposure and irradiation by sunlight. Considerable quantities of water - approximately 100 million m3/d - originate from the Witwatersrand and are discharged into the streams and rivers which feed the Vaal River. Mine drainage not only occurs from the mine itself but also from waste rock dumps and tailings areas. Often the latter two cources contain a high concentration of sulphides and/or sulphosalts wh are associated with most ore and coal bodies. The most commonly occurring sulphides are those of iron, namely the minerals pyrite, pyrrhotite and marcasite. The mining effluents exhibited extremely low pH values, typical of acid mine definings and also contained characteriscilly. drainage, and also contained characteristically high sulphate concentrations. The contents of dissolved manganese, iron, cobalt, nickel, copper and zinc exceeded the normal surface water values by a factor > 1000 for each individual metal in the case of maximum values Enrichment of dissolved chromium, cadmium and lead was less widespread but, nevertheless, the respective values were alarmingly high in several of the investigated sam-ples. (See also W77-10199) (So Africa Water Info Center) W77-11544

FRESHWATER ALGAE OF SOUTHERN AFRICA:3. PLEUROTAENIUM BREVE RACIBORSKI VAR. ENGLERI (SCHMIDLE) KRIEGER AND PENIUM GONATOZYGIFORME CLAASSEN SP. NOV. FROM TRANSVAAL, Pretoria Univ. (South Africa). Dept. of Botany.

M. I. Claassen.

Journal of South African Botany, Vol. 42, No. 4, p. 377-381, 1976. 20 fig, 4 ref.

Descriptors: *Aquatic algae, Freshwater.
Identifiers: *Pleurotaenium breve, *Penium
gonatozygiforme, Transvaal, *South Africa, Identifiers:

Pleurotaenium breve Raciborski var. engleri (Schmidle) Krieger is reported for the first time from South Africa and a new desmid species,

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

Penium gonatozygiforme Claassen, is described. Details of water composition, fixation and investigational procedures are supplied. (So African Water Info Center) W77-11546

EPIDEMICS OF WEST NILE AND SINDBIS VIRUSES IN SOUTH AFRICA WITH CULEX (CULEX) UNIVITTATUS THEOBALD AS VECTOR,

Department of Health, Johannesburg (South Africa). Arbovirus Research Unit.

B. M. McIntosh, P. G. Jupp, I. Dossantos, and G. M. Meenehan.

South African Journal of Science, Vol. 72, No. 10, p 295-300, October 1976. 7 tab, map, 12 ref.

Descriptors: *Viruses, *Human diseases, Mosquitoes, Birds, Geographical regions, Floods, *Epidemiology.
Identifiers: *Culex univittatus, Culex theileri, Karoo, West Nile virus, Sindbis virus, Orange River, Upington, Orange Free State, North Western Cape, *South Africa.

The epidemiological findings on the largest epidemics caused by West Nile and Sindbis viruses ever recorded in South Africa are described. The epidemics occurred simultaneously in 1974 in an arid region of some 2500 km2 of the Cape Province following heavy rains. West Nile virus was isolated from 6 ill persons. Post-epidemic antibody surveys on the affected human population indicated that 55% had been infected by West Nile virus and 16% by Cindbi tiple isolations of both viruses were made from Culex univittatus and Culex theileri collected in the town of Upington. Infection rates in C. univit-tatus were 1 infected mosquito per 26 for West Nile virus and 1 per 154 for Sindbis virus. In C theileri the infection rate for each virus was 1 infected mosquito per 1204. Observations on the mosquitoes in Upington indicated that C. univittatus, which is mainly ornitophilic, also fed readily on man, at least when abundant. It is concluded that C. univittatus was the main epidemic vector of both viruses. An antibody survey of the wild birds in Upington after the epidemic showed high immune rates for both viruses in several avian spe cies. It is postulated that an avian epizootic also occurred and that viraemic birds were the main source of infection for C. univittatus. (So African Water Info Center) W77-11547

VIBRIO PARAHAEMOLYTICUS - A MARINE PATHOGEN DETECTED IN SOUTH AFRICAN COASTAL WATERS,

South African Inst. for Medical Research, Port Elizabeth.

South African Medical Journal, Vol 49, No 37, p 1514-1516, August 1975.

Descriptors: *Viruses, *Public health, Pathogenic viruses, Shellfish. Identifiers: Natal, South Africa, *Vibrio parahaemolyticus, Eastern Cape, Marine pollu-

Vibrio parahaemolyticus has been detected in the Natal and Eastern Cape coastal waters of South Africa. As a proven cause of gastro-enteritis or a potential pathogen to humans, it is an organism of importance to public health. Outlines of the history, pathogenicity and identification are given, as vell as the results of the local investigation of this organism. V. parahaemolyticus has been isolated from water and shellfish in the area stretching from Coega River mouth to Willows on the Port Elizabeth coastline. The incidence appears to be seasonal and confined to the months January to July, with sea temperatures ranging from 21 July, with sea temperatures ranging from 21 degrees to 14 degrees C. Genera which have yielded the organism are Patella, Turbo, Oxystele, Perna, Crassostrea, Haliotis and Burnupena. (So African Water Info Center)

W77-11553

SERUM IMMUNOGLOBULIN LEVELS IN WHITE AND BLACK PATIENTS WITH VIRUS-A AND VIRUS-B HEPATITIS,

South African Inst. for Medical Research, Johannesburg

T. Ipp, G. M. MacNab, R. Sher, and M. C. Kew. South African Journal of Medical Sciences, Vol 41, No 4, p 259-263, 1976. 1 fig, 2 tab, 13 ref.

Descriptors: *Viruses. *Human diseases. *Public Identifiers: South Africa, *Hepatitis(Humans).

Serum immunoglobulin G, M and A levels were measured in 106 White patients with acute virus-A (hepatitis-B surface antigen-negative) hepatitis and 27 White patients with acute virus-B (hepatitis-B surface antigen-positive) hepatitis and compared with the values previously obtained in Black patients with these diseases. The mean Black patients with these diseases. The mean serum IgM level in the White patients with virus-A hepatitis was significantly higher than that in virus-B hepatitis (p < 0.001). This difference was much more obvious than that in Black patients, mainly due to a much lower mean serum IgM level in the Black patients with virus-A hepatitis. The reason for the blunted IgM response in Black patients with virus-A hepatitis is not known, but it may be related to a difference in the reaction inst the host tissues rather than any difference in antibody production against the virus per se. The mean serum IgM and IgA levels were not significantly different in the White patients with virus-A and virus-B hepatitis and they were lower than the corresponding figures in Blacks. (So African Water Info Center) W77-11562

NOTES ON THE CONSERVATION OF UMN-GAZANA ESTUARY,

Cape Town Univ. (South Africa). Dept. of Zoolo-

gy. For primary bibliographic entry see Field 2L. W77-11563

PROBLEMS ENCOUNTERED WITH EDTA AS AN ANTICOAGULANT FOR FISH BLOOD, Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology. For primary bibliographic entry see Field 5A. W77-11564

SURVIVAL AND REPRODUCTION OF OSTRACODS AS AFFECTED BY PESTICIDES AND TEMPERATURE, Northeastern Univ., Boston, Mass. Dept. of Biolo-

Y. A.-D. Khudairi, and E. Ruber. J Econ Entomol. 67(1), p 22-24, 1974.

Descriptors: *Pesticide toxicity, *DDT, Toxicity, Insecticides, *Reproduction, *Temperature, Mortality, Water pollution effects.

Chlamydotheca-arcuata, Identifiers: *Chlorpyrifos, Cypridopsis-vidua, Cyprinotus-in-congruens, *Fenthion, *Ostracods.

Toxicities of DDT, chlorpyrifos, and fenthion to Cyprinotus incongruens Ramdohr and Chla-mydotheca arcuata Sars were evaluated in laboratory cultures. For the 1st species, the series from most to least toxic was chlorpyrifos, fenthion, DDT; and for the 2nd species, it was chlorpyrifos, DDT, and fenthion. Data for 24 h were inadequate to predict field effects because mortalities in test tes increased each day, even at concentrations where no 24 h mortalities were recorded. Temperature stress which would be likely to occur in early spring and in late summer (5 and 35 C) increased insecticide toxicities at a given concentration; lowest mortalities occurred at intermediate temperatures (15 and 25 C). There is some tendency towards induction of egg-laying in these 2 spp. by toxic doses of the insecticides; the effect is even more pronounced in Cypridopsis vidua O. F. Muller. At all intermediate doses, some fraction of the eggs hatched and matured, which could be a mechanism for reestablishment of populations, but at the highest DDT doses (5.0 ppm) 0 eggs hatched.—Copyright 1974, Biological Abstracts, W77-11567

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS 3. ROODEPLAAT

National Inst. for Water Research, Pretoria (South Africa).

D. J. Steyn, D. F. Toerien, and J. H. Visser. Water SA, Vol. 2, No. 1, p 1-6, 1976. 2 tab, 6 fig, 12

Descriptors: Algae, Bioassay, *Eutrophication, Productivity, Phosphorus, Nitrogen, Inhibition, Sewage effluents, Growth rates, Water pollution Identifiers: Roodeplaat Dam, South Africa

Algal bioassays indicated that the waters of Roodeplaat Dam are severely eutrophied since algal growth potentials (AGP) of up to 200 mg/l and batch culture algal growth rates of up to 2,2 d-1 were registered with Selenastrum capricornutum as test alga. Phosphorus was usually the primary growth-limiting nutrient in the samples except at the end of winter when nitrogen was primary growth limiting. The secondary limiting nutrient was either nitrogen or phosphorus, depending on the identity of the primary growth-limiting nutrient. Addition of secondary effluent linearly increased the AGP of Roodeplaat Dam water by 7,2 to 12,4 mg/l for each one per cent (v/v) of secondary effluent added. Addition of secondary treated sewage effluent resulted in a shift to nitrogen as the primary growth-limiting nutrient.
Dilution with a low nutrient water linearly decreased the AGP. The control of phosphorus inputs into the impoundment could be used to reduce the eutrophication level. (See also W77-

EUTROPHICATION LEVELS OF SOME SOUTH AFRICAN IMPOUNDMENTS. IV. VAAL DAM, National Inst. for Water Research, Pretoria (South Africa).

01392; W77-01391; and W77-11575) (So African

Water Info Center)

W77-11568

D. J. Steyn, D. F. Toerien, and J. H. Visser. Water SA., Vol. 2, No. 2, p 53-57, 1976. 5 fig, 1 tab. 15 ref.

Descriptors: Bioassay, Algae, *Eutrophication, Phosphorus, Nitrogen, Soil conservation, Growth rates, Water pollution effects. Identifiers: South Africa, Vaal Dam, Vaal River, Selenastrum capricornutum.

The Vaal Dam shows algal bioassay growth rates and algal growth potentials (AGP) as high as 1,6d-1 and 146 mg/l-1 respectively using Selenastrum capricornutum as test alga. Addition of secondary treated sewage effluents to Vaal Dam water increased the AGP by between 7,4 and 11,2 mg/l-1 for every one per cent (v/v) added. Nitrogen and phosphorus were the important algal growth-limiting nutrients in the impoundment. Plant nutrients adsorbed onto clay particles could be important in the eutrophication of the impoundment, indicating the importance of soil conservation techniques in eutrophication control. The significance of the impoundment and the paucity in knowledge of its physical, chemical and biological characteristics suggest that such studies should be undertaken as a matter of urgency. (See also 77-01392; W77-01391; and W77-11568) (So African Water Info W77-11575

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY, WISCONSIN.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab. K. W. Thornton, D. E. Ford, and D. L. Robey. Available from the National Technical Information Service. Springfield, Va 22161 as AD-A031415, Price codes: A10 in paper copy, A01 in microfiche. Miscellaneous Paper Y-76-5, October 1976. 204 p, 106 fig, 14 tab, 33 ref, 1 append.

Descriptors: *Mathematical models, *Algae, *Bioassay, *Wisconsin, *Nutrients, *Water quality, Model studies, Analytical techniques, Mathematics, Eutrophication, Nitrates, Phosphates, Fisheries, Flood control, Dissolved oxygen, Temperature, Recreation

perature, Recreation. Identifiers: "Ecological models, "Nutrient loadings, "LaFarge Lake(Wis), "Kickapoo River(Wis), "Vernon County(Wis), Algae concentrations, Algal bioassays, Impoundment water quality.

The water quality of the proposed LaFarge Lake, Wisconsin, was investigated using a version of the reservoir portion of the Water Quality for River-Reservoir Systems (WQRRS) ecological model. Although other water quality constituents were simulated, the study concentrated on temperature, dissolved oxygen, and algae concentrations. Daily field measurements of phosphorus and nitrogen on the Kickapoo River were used in the simulations. al bioassays also were conducted on th Kickapoo River surrounding impoundments. The assays indicated that essentially all of the soluble nitrogen and phosphorus in the river were in forms available for algal growth and that phosphorus was most likely to be the limiting nutrient in the proposed impoundment. The simulations indicated that LaForge Lake probably will be thermally stratified from May through September. Dissolved oxygen was distributed throughout the reservoir except for a period of approximately one month in late summer when the hypolimnion became anoxic. A bloom of diatoms and green algae during the spring and two major blooms of blue-green algae during summer and fall were predicted. The blooms of algae were found to be similar in magnitude and timing to blooms observed in surroun ing lakes. Secchi disk depths should be greater than 1.3 m. Phosphorus loadings were calculated and examined. The loadings were found to be of the same magnitude as other impoundments in the area. Steady-state temperature routings of the release water were conducted to determine the extent of the river reach that can be expected to support a cold water fishery. For the recommended operational schedule, temperatures remained below 22.0 C for a distance of 35.7 km below the project. (Henley-ISWS) W77-11584

PLUTONIUM-237: COMPARATIVE UPTAKE IN CHELATED AND NON-CHELATED FORM BY CHANNEL CATFISH (ICTALURUS PUNC-TATUS)

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

L. D. Eyman, and T. R. Trabalka. Health Physics, Vol 32, June 1977, p 475-478, 1 fig, 1 tab. 16 ref.

Descriptors: Environmental effects, *Plutonium, Behavior, Aquatic environment, Chelation, *Channel catfish, *Absorption, *Radioisotopes, Radioactivitiv.

Three chemical forms of plutonium 237 (Pucitrate, Pu-fulvate and Pu-hydroxide) were administered to channel catfish by intragastric injection. From experimental results it was concluded that chelation can either enhance or reduce uptake of plutonium relative to PuOH (monomer) in channel catfish. Pucitrate penetrates the gut membrane due to a net negative charge of the complex.

Reduced uptake of Pu-fulvate may be attributable to its stability in the presence of digestive systems and high molecular weight which decreases passage of the complex through the gut wall. (Chilton-ORNL) W77-11642

SUSCEPTIBILITY OF THREADFIN SHAD TO IMPINGEMENT,

IMPINGEMENT, Oak Ridge National Lab., Tenn. Environmental Sciences Div.

J. S. Griffith, and D. A. Tomljanovich.

In: The Proceedings of the 29th Annual Conference of the Southeastern Association of Game and Fish Commissioners, 1975. p 223-234, 4 fig, 5 tab. 6 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Fish, Powerplants, Tennessee Valley Authority.

Identifiers: Cold-stress, Impingement, *Threadfin shad.

The objectives were to descibe the behavior and swimming ability of threadfin shad exposed to laboratory induced cold temperatures, to evaluate the susceptibility of cold-stressed shad to, and ability to recover from, impingement, and to examine the quantitative seasonal effects of impingement. Results indicated that water temperatures below approximately 12 C induced stress in adults, leading to increased impingement and mortality rates. Their ability to resist impingement in a test flume was severely impaired below 8 C. Most unstressed adults were capable of swimming against the intake velocities encountered at most TVA power plants during warm periods of the year. Unstressed shad were observed to explore the intake screen area and then attempt to swim upstream leaving the vicinity of the screen. Shad that were severely cold-stressed displayed a symptomatic uncoordinated swimming behavior that lasted for several hours. Data collected at five TVA fossilfuel plants indicated the existence of a strong relationship between shad impingement and low am bient water temperature. Sampling at Brown's Ferry Nuclear Plant suggested a hypothetical annual shad impingement cycle for that plant which was largely dependent on the size of the fish and the yearly temperature pattern. (Chilton-ORNL) W77-11643

FEEDING ECOLOGY OF EELGRASS FISH COMMUNITIES,

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

S. M. Adams. Transactions of the American Fisheries Society, Vol 105, No 4, July 1976, p 514-519, 2 fig, 3 tab, 17 ref.

Descriptors: *Ecology, Communities, Fish, Food, Growth stages, *Fish population, Fish diets. Identifiers: *Eelgrass fish communities.

Fish were collected from two eelgrass beds located in shallow estuaries. Analysis showed that detritus was the most important food item in the diets of juvenile pinfish, pigfish, adult pinfish, spot and filefish. Other important food items were planktonic copepods and epifaunal crustaceans. Food material produced within the eelgrass beds probably contributed up to 56% by weight of the diet of the eelgrass fish community. Pinfish were the dominant fish in the community. Pinfish were the dominant fish in the community. The general trend in the feeding habits of pinfish appeared to be a dominance of planktonic copepods in the diet un til the pinfish reach a length of about 35 mm, followed by a gradual replacement by detritus, and then an omnivorus stage at about 70 mm at which time an increasingly larger percentage of polychaetes and plant material is consumed. (Chilton-ORNL)

ORGANIC CONTAMINANTS IN AQUEOUS COAL CONVERSION EFFLUENTS: ENVIRON-MENTAL CONSEQUENCES AND RESEARCH PRIORITIES,

Oak Ridge National Lab., Tenn. Environmental Sciences Div.
S. E. Herbes, G. R. Southworth, and C. W. Gehrs.

S. E. Herbes, G. R. Southworth, and C. W. Gehrs. In: Trace Substances in Environmental Health-X, 1976. A symposium held at the University of Missouri, Columbia. D. D. Hemphill, Ed. p 295-303, 4 fig. 2 tab 11 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Effluents, *Organic compounds, Toxicity, Absorption, *Organic wastes. Identifiers: Coal conversion.

A literature réview is presented which compiles a list of organic components of aqueous coal liquefaction effluents. Five major classes of organics are identified: (1) phenols, (2) arylamines, (3) aliphatic hydrocarbons, (4) mono- and polycyclic hydrocarbons, and (5) sulfur-containing compounds (thiophenes and mercaptans). Each class is assessed on the basis of concentrations anticipated in coal liquefaction effluents, removal by wastewater treatment systems, acute toxicity, chronic toxic effects on aquatic organisms, and environmental transport and persistence. It was concluded that while phenols and monoaromatic hydrocarbons constitute major constituents of coal conversion effluents, their potential environmental impacts may be far less than those of polycyclic hydrocarbons and heteroatomic compounds. Multi-ring compounds may be difficult to remove from wastewaters, are slowly degraded, possess potentials for both bioaccumulation and carcinogenic and mutagenic effects, and their environmental behavior at trace concentrations is poorly understood. (Chilton-ORNL)

EFFECTS OF WATER VELOCITY ON ACTIVI-TY OF JUVENILE STRIPED BASS,

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

R. R. Bowles, J. S. Griffith, and C. C. Coutant. Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/TM-5368, Price cos: A05 in paper copy, A01 in microfiche. Report ORNL/TM-5368, July 1976, 73 p, 17 fig, 5 tab, 51 ref.

Descriptors: *Environmental effects, Water velocity, *Bass, Fry, Larvae, Behavior, Swimming, Temperature, Food, Cooling water. Identifiers: Morone saxalilis, Striped bass.

Juvenile striped bass 8 - 80 mm long were tested in a simulation of a fixed screen cooling water intake structure. Water velocity increases of 0 - 30 cm/sec resulted in decreases in the area and distance traveled by juveniles 10 - 80 mm long. Water velocity increases of 0 - 30 cm/sec resulted in increases in area and distance traveled by larvae. The activity of larval bass increased in the presence of food while the presence of food decreased the activity of juveniles. It was concluded that approach velocity limits swimming activity in proportion to body size. Investigations also showed that low temperature reduced swimming activity. (Chilton-ORNL)

CONTRIBUTION OF GUT CONTENTS TO THE CONCENTRATION AND BODY BURDEN OF ELEMENTS IN TIPULA SPP. FROM A SPRING-FED STREAM.

Oak Ridge National Lab., Tenn. Environmental Sciences Div.

J. W. Elwood, S. G. Hildebrand, and J. J.

Beauchamp.
Journal of the Fisheries Research Board of Canada, Vol 33, No 9, 1976. p 1930-1938, 5 fig, 3 tab, 17 ref.

Group 5C-Effects Of Pollution

Descriptors: Environmental effects, *Water pollution effects, Laboratory tests, Aquatic animals, Insects, Food chains, Streams, *Trace elements, Larvae, Regression analysis.
Identifiers: Trophic transfer factors, Gastroin-

testinal tract, *Tipula spp, Whole-body concentra-

Whole body concentrations of 30 elements were measured in larvae of Tipula spp. before and after the larvae had egested their gut contents. Linear regression analyses of concentration of each ele-ment on mean dry wt/individual showed that for larvae with gastrointestinal tracts filled, there was a highly significant inverse relationship between Cr concentration and mean individual dry weight. Slopes of the remaining elements were not significantly different from zero. For larvae with trointestinal tracts evacuated, there was a highly significant inverse relationship between concen trations of Cr and A1 and mean dry weight with all other slopes not being significantly different from zero. Trophic transfer factors were calculated to determine if there is food chain enrichment of the 30 elements analyzed. Most of the calculated ratios were less than 1, indicating that enrichment of most elements is not occurring at this level of the detritus food chain. (Chilton-ORNL) W77-11649

DISTRIBUTION OF NITRIFYING AND HETEROTROPHIC MICROORGANISMS IN CUTOVER PEATS, M. Herlihy.

Soil Biol Biochem. 5(5), p 621-628, 1973.

Descriptors: Microorganisms, *Bacteria, Nitrogen fixing bacteria, Actinomycetes, *Peat, Fungi, Path

of pollutants, Distribution.
Identifiers: *Heterotrophic bacteria, *Nitrifying bacteria, Nitrobacter, Nitrosomonas.

The distribution of chemoautotrophic nitrifiers. heterotrophic bacteria, actinomycetes and fungi was studied in raised peats and compared with a mineral garden soil. Nitrosomonas was not de-tectable but a few Nitrobacter were counted 350 cm below the surface of undrained peat, in the surface areas of drained non-cutover peat and in an area cutover before sampling. After only 3 yr cultivation and cropping the average numbers, over 12 monthly samplings, of Nitrosomonas and Nitrobacter had risen to 1.25 x 106, and 32.7 x 106, respectively. The possible reasons for the anomalously high proportion of Nitrobacter are discussed, including the effect of media composition. A NaHCO3 medium gave lower numbers of Nitrosomonas and higher numbers of Nitrobacter than CaCO3 medium. The proportional increase in the heterotrophs was lower than that of the autotrophs. This suggested that low availability of organic substrate and not the physical environment was the limiting factor. Only fungi showed a definite seasonal variation.—Copyright 1974, Biological Abstracts, Inc.

EMERGENCE OF CHIRONOMIDAE (DIPTERA) FROM CHAR LAKE, NORTHWEST TERRITORIES. Biol. Stn., Saint Andrews, N. B., Can. H. E. Welch, Jr. Can J Zool. 51(11), p 1113-1123, 1973.

Descriptors: *Canada, *Diptera, Lakes, Insects, Invertabrates, *Aquatic insects. Identifiers: Cricotopus, Heterotrissocladius, Lauterborniella, Orthocladius, Pseudodiamesa, Trissocladius, *Char Lake(NWT).

Quantitative data, using 1/4-m2 submerged traps, were obtained on the 6 common chironomid genera (Pseudodiamesa, Trissocladius, Orthcladius, Lauterborniella, Heterotrissocladius and Cricotopus) in Char Lake, Northwest Territo-ries, Canada, at latitude 74 56' N. Emergence of each species was highly synchronized and in 1972 occurred partly or wholly beneath ice. Each species had different emergence distributions compared with depth, with only 2 spp. constituting virtually the entire emergence in the deep sediment zone below 15 m. Emergence/m2 was highest in the shallow areas and the bulk of emergence came from the upper 3rd of the lake. Total emergence was 690 individuals m-2 lake surface in 1971, equal to 0.143 g m-2 year-1 or 0.798 kcal m-2 year-1; this is equal to 0.5% of the lake's total energy flow.—Copyright 1974, Biological Abstracts, Inc. W77-11652

LAKE ONTARIO ATLAS: CHEMISTRY,

New York Sea Grant Inst., Albany. E. R. Allen.

ake Ontario Atlas No. NYSSGP-OA-77-010, 1977, 193 p. 11 tab, 230 ref.

scriptors: *Water quality, Lakes, Great Lakes, *Lake Ontario, Eutrophication, Chemistry, Bioin-dicators, Organic compounds, Water pollution. Identifiers: *Oligotrophic lakes, International Field Year for the Great Lakes(IFYGL).

The chemical and water quality characteristics of Lake Ontario reported prior to the International Field Year for the Great Lakes (IFYGL, 1972-73) study have been reviewed and summarized. The low surface-to-volume ratio of this lake has allowed it to retain oligotrophic characteristics based upon biological parameters. However, some of the chemical parameters, including the nutrient imputs and concentrations, suggest that eutrophication is imminent. In general, the water quality of Lake Ontario is good and projected increases in the loadings of major ions do not pose a threat to the use of this natural water resource during the rest of this century. The input of trace materials, such as the heavy metals and refractory organic compounds, is cause for concern since a significant contribution is made by an uncontrollable source, namely atmospheric precipitation. More stringent controls on the discharge of phophorus, trace elements and sythetic organic compounds are recommended to preserve the integrity of lake Ontario for the continued benefit of all users of its vater. (NOAA) water. (NO. W77-11654

OBSERVATIONS OF CRASSOSTREA VIRGINICA CULTURED IN THE HEATED EF-FLUENT AND DISCHARGED RADIONUCLIDES OF A NUCLEAR POWER

REACTOR, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service.

A. H. Price II,, C. T. Hess, and C. W. Smith.

Maine Sea Grant Technical Report No. 14, Reprinted from: Proceedings Of the National Shellfisheries Association, Vol 66, 1976. Also as Ira C. Darling Center Contribution No. 88. 16 p, 18 fig, 24 ref. SG-04-3-158-63 and 04-5-158-39.

Descriptors: *Maine, *Aquaculture, *Heated water, *Nuclear powerplants, *Nuclear reactors, *Oysters, *Thermal pollution, Water pollution, Radioisotopes, Bays, Maine.

Identifiers: Waste heat utilization, Montsweag

American ovsters (Crassostrea virginica) were rafted for 26 months at four sites in the effluent waters near Maine Yankee Nuclear Power Reactor in Montsweag Bay and at a control site in the adjacent Damariscotta River. In an evaluation of the thermal effluent for aquaculture, comparisons are made among the sites of the effects of heated effluent on oyster growth and condition, and the uptake and retention of gamma-ray emitting radionuclides. Growth and uptake of radionuclides were accelerated at the warmer water sites. Ob served variations in concentrations of gamma-ray emitting radionuclides in the biological component of this study are compared with a pulse driven relaxator model and an existing concentration fac-tor model. Results show that although the concentration factor model is adequate for simple laboratory studies, the pulse driven relaxator is necessary to describe both the amplitude and time variation observed in this field study. Both experimental results and calculations for 58Co and 54Mn are presented. (NOAA) W77-11655

NEW ENGLAND OFFSHORE MINING EN-VIRONMENTAL STUDY (PROJECT NOMES), National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research

For primary bibliographic entry see Field 2L. W77-11660

WASTE HEAT EMPLOYMENT FOR AC-CELERATED REARING OF COHO SALMON, Washington Univ., Seattle. Div. of Marine

E. L. Brannon, R. E. Nakatani, and L. R. Donaldson.

Sea Grant Reprint No. WSG-TA 77-9, Reprinted from: Proceedings of the Conference on Waste Heat Management and Utilization, held Miami Beach, FL, 9-11, May 1976. 10 p, 1 tab, 11 ref.

Descriptors: *Industrial wastes, *Growth rates, *Heated water, *Salmon, Biomass, Thermal pollu-

Identifiers: Waste heat, *Coho salmon.

Studies conducted at the College of Fisheries, University of Washington on the use of waste heat to accelerate growth of coho salmon (Oncorhynchus kisutch) have shown that a year reduction in freshwater rearing can be induced, without altering the marine residence period of this species. The result of this strategy has been to reduce coho generation time from three to two years, with substantial savings in hatchery production costs and increased biomass return. Application of this concept is considered in utilization of industrial waste heat. (NOAA) W77-11664

DISINFECTION OF WASTEWATER, TASK FORCE REPORT.

Environmental Protection Agency, Washington, D.C. Office of Water Program Operations For primary bibliographic entry see Field 5D. W77-11672

WATER-OUALITY EFFECTS FROM URBAN

Woodward-Clyde Consultants, San Francisco, Calif.

R. Pitt, and R. Field.

Journal of the American Water Works Associa-tion, Vol 69, No 8, p 432-436, August, 1977. 3 fig, 6

Descriptors: *Urban runoff, *Storm water, "Model studies, "Urban hydrology, "Water management(Applied), Cities, Oxygen sag, Water quality, Costs, FOrecasting, Runoff forecasting, Precipitation(Atmospheric), H Sewage treatment, Waste water treatm Hydrographs,

A hypothetical example was used to demonstrate potential problems and possible solutions for urban storm water runoff. Hypothetical inputs, loading, worst-case storm predictions, quality-quantity hydrographs, a comparison of storm water quality and sanitary waste water effluent quality, effects on receiving waters, and costs of required treatment were included in the example case study for a hypothetical city of 100,000 peo-le. Total solids concentration curves were elecole. Total solids concentration curves were co ple. Total solids concentration using various storms simulated in the study. Oxygen sag curves were calculated to show oxygen depletion in receiving

waters caused by secondary treated sewage and untreated urban runoff. Costs for treatment processes in use at various locations within the United States are compared. Total waste discharge analysis, water quality management planning, and more research on the long-term toxic effects of storm flow were suggested to help solve urban ru-noff problems. (Schulz-FIRL) W77-11676

LIMNOLOGICAL STUDIES OF THE ONO THIRD REPORT. RESERVOIR: JAPANESE).

Jap J Limnol. 34(1), p 35-40, 1973.

Descriptors: Zooplankton, *Nutrients, Limnology, *Reservoirs, *Distribution, Water temperature, Dissolved oxygen, Hydrogenion concentra-

Identifiers: Bosmina-longirostris, Bosminopsisdeitersi, Chonochiloides-dossuarius, Cyclops-sp, Eudorina-elegans, Japan, Keratella-cochlearis, Oscillatoria-tenuis, Pediastrum-tetras, Ploesomatruncatum, Polyarthra-sp, Scenedesmus, Stavras-trum-sp, Synchaeta-pectinata, Synedra-ulna, trum-sp, Synchaeta-

The vertical distributions of water temperature, pH values, amounts of dissolved oxygen and plankton in the Ono Reservoir (Japan) are described. No epilimnion developed in summer, a slight metalimnion being recognized just below the water surface. In Sept., however, a thin epilimnion developed down to the depth of 2 m. In autumn and winter, the dissolved O2 was about equal from the surface to the bottom, but it was especially rich in Feb. In summer, the O2 in the deeper layers decreased remarkably. In 1964, this phenomenon occurred in June, earlier than in the preceding yr (1962, 1963). This seems to be due to the density current of cold inflowing river water after rain.
The difference of pH was scarcely seen
throughout the layers, except in summer. In winter
it remained unchanged. The zooplankton decreased in 1964 in the number of species and in abundance. Synchaeta pectinata occurred in small numbers in the seasons other than summer. Keratella cochlearis, Ploesoma truncatum, Polyarthra sp. were also fewer in numbers than in the previous 2 yr, and the time of their appearance was different. In 1964 Chonochiloides dossuarius was found which appeared also in 1962, but not in 1963. Only 2 spp., of Cladocera, Bosmina longirostris and Bosminopsis deitersi were found. The abundance of Cyclops sp. decreased, the time of appearance being the same as in 1963. In 1964 the following 4 spp. appeared for the 1st time: Pediastrum tetras, 2 spp. of Scenedesmus and Staurastrum sp. The occurrence of 3 spp. of algae, Oscillatoria tenuis, Synedra ulna and Eudorina elegans suggest that the water of this artificial lake is rich in nutrient salts.--Copyright 1974, Biological Abstracts, Inc. W77-11713

PROBLEMS RELATED TO WATER QUALITY OVER THE DANUBE SECTION BETWEEN RAJKA AND ESZTERGOM (A RAJKA-ESZTER-DUNA-SZAKASZ KOZOTTI MINOSEGI PROBLEMAI), Eszakdunantuli Vizugyi Igazgatosag,

Gyor(Hungary). For primary bibliographic entry see Field 5B. W77-11738

DISINFECTION EFFICIENCY AND RESIDUAL TOXICITY OF SEVERAL WASTEWATER DIS-INFECTANTS: VOLUME I - GRANDVILLE, MICHIGAN, Grand Valley State Colleges, Allendale, Mich.

Dept. of Biology.
For primary bibliographic entry see Field 5D.
W77-11762

OBSERVATION ON THE HYDROLOGY OF THE RIVER KHAM,

Marathwada Univ., Aurangabad (India). Dept. of Zoology. For primary W77-11769 nary bibliographic entry see Field 5B.

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STA-TION KLIPPER GOLF COURSE, Hawaii Univ., Honolulu. Water Resources

Research Center. For primary bibliographic entry see Field 5D. W77-11792

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALI-TY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,

Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. A. S. Rogowski, H. B. Pionke, and J. G. Broyan. Journal of Environmental Quality, Vol. 6, No. 3, p 237-244, July-September 1977. 64 ref.

Descriptors: *Strip mines, *Water quality, Reclamation, Physical models, Soil water, Soil chemistry, Erosion, Acid generation, Spoil temperature.

Current literature contains numerous studies of acid generation, neutralization, and transformation in strip-mine spoil materials, yet the rate-determining processes on the field scale are not well understood. Even less seems to be known about the spoil water flow, oxygen diffusion, surface runoff, erosion, evapotranspiration, and tem-perature distributions within the spoil banks. Most spoils seem to be principally considered from the standpoint of rapid revegetation, use of amend-ments, and favorable placement of acid-producing materials. It is concluded that hydrology of the spoil system could be simulated using standard modeling techniques. It also seems probable that experimentally obtained temperature and oxygen distributions could delineate acid-producing are assuming pyrite is not limiting and is distributed evenly throughout the zone of interest. (ARS) W77-11833

STUDIES ON THE GUPPY, LEBISTES-RETICULATUS PETERS IN YOSHIKAWA RIVER, CHIBA CITY, (IN JAPANESE),

Tokyo Univ. (Japan). Dept. of Parasitology. S. Katayama, M. Fujimagari, J. Otawara, J. Miyamoto, and N. Nihei. Jap J Sanit Zool. 23(3), p 169-179, 1973.

Descriptors: Ecology, Water pollution effects, Sewage, Water temperature, Asia, Water wells, Rivers.

Identifiers: Chiba City, Japan, *Lebistes-Reticulatus, Tokyo, *Yoshikawa River(Japan), Tropical

A joint study was conducted for a period of over 1 yr on the ecology of the guppy. L. reticulatus, which was discovered in the autumn of 1970 to be breeding in highly polluted water of Yoshikawa River running through the heart of Chiba City neighboring Tokyo, Japan. Being a tropical fish of the family Poecilidae, the guppy, a native of South America is known widely as a popular aquarium fish and also as an efficient natural enemy of mosquitoes that breed in sewage waters. Previous observations in Japan have shown that the fish observations in Japan nave shown cannot survive outdoors over the freezing temperature during the winter season, but is established as wild colonies in sewage ditches in several hotspring areas, where the water tempera-ture is above 15C throughout the year. Yoshikawa is a small river of about 8 km in length and 0.2/1,000 in the average slope. The upper stream receives sewage water of public housing areas built in the outskirts of the city and a large quantity

of underground water pumped up from natural gas wells is discharged continuously into the river. The wells is discharged continuously into the river. Inc well water is about 30°C, and keeps the water tem-perature downstream not lower than 20°C even dur-ing the winter. The guppies breed along the full length of the river during the summer season from July-Oct. but their distribution became restricted during the winter season to downstream of the natural gas well where the water temperature was higher than 17C. Seasonal observations of the chemical, physical and biological characters of the river water were caried out at 3 stations, at least 4 times a year. Results of both chemical and biological analysis of the water samples showed that the river water was highly polluted, with BOD (biological oxygen demand) values from 6.5-20.7 ppm and with either beta-polysaprobic or alpha-mesosaprobic biological systems. —Copyright 1974, Biological Abstracts, Inc.

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULA-TIONS IN LAKES,
Wisconsin Univ.-Madison. Water Chemistry Lab.

B. W. Vigon, and D. E. Armstrong.

Available from the National Technical Informa Avanatic from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 315, Price codes: A07 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS WRC 77-06, 1977. 117 pp, 26 tables, 28 figs, 109 refs. OWRT A-061-WIS(1), 14-31-001-3850, 14-31-0001-5050.

Descriptors: *Silica, *Phosphorus, *Diatoms, Eutrophication, Lakes, "Algal control, "Nuisance algae, Growth rates, Wisconsin, Dis-solved solids, Cyanophyta, Water pollution ef-fects, Pollution abatement. Identifiers: *Lake Mendota(Wisc).

The role of the vernal diatom population in the removal of P and Si from the lake water was evaluated for Lake Mendota, Madison, Wisconsin in 1974. Measurements were made of total and dissolved reactive P and Si (DRP and DRSi) in the lake water as thermal stratification (3 June). The amounts of P and Si in the lake water decreased markedly between 3 March and 1 May. This time period corresponded to the development and sedimentation of the vernal diatom population. Maximum apparent removals of DRP and DRSi were about 40 and 94%, respectively. Corresponding values for removal of total P and diatom Si were 21 and 72%, respectively. Following sedimentation, mineralization of the diatom population apparently contributed to an increase in the levels of both P and Si in the lake water. Through a combination of field and laboratory measurements, the inputs of Si and P from the drainage basin and the bottom sediments and the losses via outflow were esti-mated. Using this information and the apparent removal values, the net amounts of P and Si removed by the diatom population were estimated. The net amounts removed prior to thermal stratification were 62% for DRP and 72% for DRSi. The results show that the vernal diatom population can substantially reduce the amounts of P available to support the growth of nuisance blue-green algae during the summer. W77-11864

NUTRIENTS IN THE NEUSE RIVER ESTUARY. North Carolina State Univ. at Raleigh, Dept. of Zoology. Available from the National Technical Inform

rion Service, Springfield, VA 22161 as PB-256 092, Price codes: A09 in paper copy, A01 in microfiche. Sea Grant Report No. UNC-SG-75-21, December 1975. 191 p, 71 fig, 8 tab, 19 ref, 2 append. SG-04-

Descriptors: *Nutrients, Descriptors: *Nutrients, *Water quality, *Baseline studies, *Estuaries, *North Carolina,

Group 5C-Effects Of Pollution

Identifiers: Outer Continental Shelf, *Neuse River Estuary(NC).

The Neuse River Estuary extends some 42 miles from slightly upstream of New Bern, North Carolina, to Pamlico Sound. The estuary is quite shallow with depths ranging from 10 to 20 feet on the average. Tides are small so the amount of inflowing water is the single most important factor controlling circulation and salinity. The objective of this research was to determine the extent of eutrophication and the annual cycle of nutrient concentrations in both the Neuse River Estuary and the Albemarle Estuary. The report covers the data collected from September 1970 to January 1974. The estuary of the Neuse River is currently biologically rich. Fish are abundant at certain times of the year and crabs and shrimp are common. The estuary is functioning properly despite the algal blooms and high respiration rates, however one unanswered question is whether the condition of the river would be improved if the organic load were to be reduced. (Sinha-OEIS) W77-11886

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL NORTHEAST GULF OF ALASKA.

National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research

For primary bibliographic entry see Field 6G. W77-11887

VLCC 'METULA' OIL SPILL,

Texas A and M Research Foundation, College Sta-

For primary bibliographic entry see Field 5G. W77-11889

SUBLETHAL EFFECTS OF PETROLEUM FRACTIONS ON THE BEHAVIOR OF THE LOBSTER, HOMARUS AMERICANUS, AND THE MUD SNAIL, NASSARIUS OBSOLETUS, Marine Biological Lab., Woods Hole, Mass. Boston Univ. Marine Program.

Reprinted from: Proceedings of Estuarine Research Federation Meetings, 1975. 24 p, 4 tab, 11 ref. ERDA-AT(11-1)-3567.

Descriptors: *Water pollution effects, *Toxicity, *Animal behavior, Crustaceans, Mollusks, Invertebrates, Lethal limit, *Lobster, *Snails. Identifiers: *Outer Continental Shelf, Petroleum, Hydrocarbons, *Sublethal effects, Pollution effects, Nassarius obsoletus, Mud snails.

Studies on sublethal effects of petroleum fractions on behavior of H. americanus and N. obsoletus are summarized in an attempt to clarify contradictory results and to gain an understanding of the under-lying principles. There appear to be a surprising number of similarities in the way specific petroleum fractions affect the behavior of a crustacean arthropod and a gastropod mollusc. The hypothesis is advanced that (1) specific hydrocarbon fractions in specific amounts are responsible for distinct behavioral changes; (2) these fractions are present in varying quantities in different oils; (3) the changes in behavior are general enough to af-fect a large number of marine invertebrates in a similar manner. (Sinha - OEIS) W77-11890

SOCIAL COST OF OIL POLLUTION, For primary bibliographic entry see Field 5G. W77-11892 ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVER-

North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 6G. W77-11897

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME II: APPENDICES,

North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies. For primary bibliographic entry see Field 6G.

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY

National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD/A-026 347, Price codes: A06 in paper copy, A01 in microfiche. Informal Report No. 107, April 1976.

97 p, 3 fig, 2 tab, 2 ref, 4 append.

Descriptors: *Environmental effects, *Dredging, *Water pollution effects, *Connecticut, Waste disposal.

Identifiers: Spoil disposal, Species diversity, Thames River(CT).

The Middle Atlantic Coastal Fisheries Center presented comparative data on benthic macrofauna populations of June 1974 (predisposal) versus June 1975 and October 1974 versus October 1975. At a station representing the original disposal point, significant decreases (according to 95% confidence limits) were found between Junes in number of individuals (N), number of species (S) and Shannon-Weaver species diversity (H'). The species primarily responsible for these changes were listed. No species had systematic increases or decreases which might dictate their use as indicators of spoiling impacts. These changes were thought attributable more to natural yearly fluctuations than to spoil effects, since large declines in density were seen at 'control' stations two n. mi. from the disposal buoy, while much smaller decreases were found at five stations at one n. mi. distances from dumping. Preliminary comparisons of October 1974 versus October 1975 samples again reveal apparently random, rather than spoil-related, changes outside of the spoil pile itself. The University of Connecticut found only limited correlations between suspended loads in the Thames River and season or streamflow. The New York Ocean Science Laboratory, conducting current measurements over a lunar day, again found net bottom drift to be in a WNW direction on a flooding tide. On the next ebb, resultant bottom blow was toward the ESE, whereas prior surveys had documented NE to E net drifts. (Sinha - OEIS)

STUDY ON THE EFFECTS OF MAIN-ENANCE DREDGING ON SELECTED TENANCE ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI.

Water and Air Research, Inc., Gainesville, Fla. Available from the National Technical Informa to Service, Springfield, VA 22161 as ADJ-024 069, Price codes: A15 in paper copy, A01 in microfiche. Final Report to U.S. Corps of En-gineers, Mobile, Ala., Mobile District, July 1975. 552 p, 7 append. DACW01-74-C-0156.

Descriptors: *Dredging, *Environmental effects, *Resources development, *Baseline studies, Ecology, Mississippi. rs: Natural variations, Seasonal varia tions. *Mississippi Sound.

An assessment of the environmental effects of maintenance dredging in Mississippi Sound in 1974 is given. Background conditions were measured before and after dredging, and extensive monitor-ing was conducted during the dredging operation. It was found that dredging had no significant or lasting effect on any of the conditions evaluated in this investigation. Turbidities and suspended solids were measured in the Sound and the size and dispersion of the discharge plume were defined. Distributions and levels of bacteria and heavy metals were studied to measure their release from the sediments to the waters. The biological parameters investigated were: plankton, coliform bacteria, and benthic invertebrates. Biological oacteria, and oentine invertebrates. Biological changes in the Sound were dominated by natural variations and seasonal changes rather than by dredging. No significant environmental impact was caused by maintenance dredging. (Sinha-OEIS) W77-11901

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES, Delaware Univ., Newark. Coll. of Marine Studies. V. Klemas, D. Bartlett, W. Philpot, and G. Davis. Available from the National Technical Information Services. tion Service, Springfield, VA 22161 as N76 23652, Price codes: A02 in paper copy, A01 in microfiche. Progress Report to NASA Goddard Space Flight Center, April 30, 1976. 16 p, 4 fig, 1 tab, 9 ref. NASS-20983.

Descriptors: *Delaware, *Oil spills, *Oil pollution, *Environmental effects, *Water pollution effects, Wetlands, Resources, Bay, Estuaries, Remote

Identifiers: *Outer Continental Shelf, Oil slicks, Resources management, *Delaware Bay region. Ocean

Studies of the Delaware Bay region with LAND-SAT-land-2 have so far produced useful results for all six objectives outlined in the work statement. The objectives are: (1) Monitoring the dispersion and movement of ocean dump plumes; (2) suspended sediment concentration mapping; (3) current circulation and boundary charting for a model which predicts the movement of oil slicks; (4) coastal land use and vegetation studies; (5) comparison of training site and spectral signature (with atmospheric correction) techniques for classifying coastal land cover and environmental impact; and (6) impact of Outer Continental Shelf development on the coastal zone of Delaware. (Sinha-OEIS) W77-11903

INFLUENCE OF PUMP STORAGE AND GENERATION ON COMMERCIAL FISHERIES

POTENTIAL OF RESERVOIRS, Arizona State Univ., Tempe. Lower Colorado River Basin Research Lab. W. L. Minckley, and R. M. McNatt.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-247 488, tion service, Splinghen, vA 22101 as FB-24 400, Price codes: A03 in paper copy, A01 in microfiche. Arizona Game and Fish Department Completion Report for Project No. 4-19-R, for the Period June 1972 to June 1975, November 1975. 31 p. 26 fig. 19

Descriptors: *Water quality, *Baseline studies, *Water quality standards, *Pumped storage, Reservoirs, Hydroelectric plants, Water storage, Arizona, Water management, Water temperature, Eutrophication, Thermal pollution. Identifiers: Salt River reservoirs(AZ), Total dissolved solids

A compilation of selected information on the impacts of pumped-storage - generation installations and operations on the two, lowermost, on-river reservoirs of the Salt River chain in Central Arizona is given. These water storage and

delivery, plus hydroelectric generating reservoirs are situated at low elevation in Lower to Upper Sonoran Desert habitats; and have been subjected to massive, and somewhat unique modifications over the past 12 years. The most massive changes have been drying and refilling of the three lower-most reservoirs for repair and/or modifications of outlet structures, installation of pump-storage eneration units on two of the dams, and char in the generation capacities and operations of the upstream dam (Roosevelt Dam, impounding Roosevelt Lake). It appears that on-line pump generation operations effect substantial thermal loading of downstream reservoirs. Also, disruption of the tremendous thermal stability achieved in these bodies of water prior to high levels of pump - generation operation is evident. With in-creased surface temperatures, increased evapora-tion rates would be expected, with an attendant increase in total dissolved solids. The marked variablity of these features in the Salt River system of reservoirs, resulting from sporadic in-flows of waters in years of flood and in years of drought, make interpretation of data contingent upon examination of many past years of informaion. (Sinha-OEIS)

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,

Ohio State Univ., Columbus. For primary bibliographic entry see Field 2H. W77-11926

THE EFFECT OF INCREASED REGULATION ON A NORWEGIAN LAKE, (IN NORWEGIAN), Zoologisk Museum, Oslo (Norway). For primary bibliographic entry see Field 5G. W77-11931

IMPACTS OF FOREST MANAGEMENT PRAC-TICES ON THE AQUATIC ENVIRONMENT PHASE III.

Washington Univ., Seattle, Coll. of Forestry. For primary bibliographic entry see Field 4C. W77-11941

THE EFFECT OF FEEDLOT RUNOFF ON COMMUNITY STRUCTURE IN THE COTTON-WOOD RIVER, KANSAS, Kansas State Teachers College, Emporia. Dept. of

Biology. N. L. Edwards.

M. S. Thesis, Kansas State Teachers College, May, 1970, 25 p. 3 fig, 8 tab, 15 ref.

Descriptors: *Agricultural runoff, Feed lots, *Kansas, *Water pollution effects, *Benthic fauna, Farm wastes.

Identifiers: Cottonwood River(Kan), Neosho

Water pollution from feedlots has become a serious problem throughout many central and southwestern states due to increase of the concentration of livestock and the number of feedlots. This study exemplifies this situation. Five stations on the Cottonwood and Neosho Rivers in Kansas were sampled periodically from September, 1968, to October, 1969. Benthic invertebrate community structure was subjected to conventional and species diversity analyses. Although there were several possible sources of pollution other than several possible sources of pollution other than feedlots, feedlot runoff did appear to significantly effect community diversity. This was seen by the decreasing diversity downstream from Station I, by an increase in diversity at those stations farthest downstream from feedlots, and by the higher diversity downstream from Emporia's sewage treatment plant which inferred that the Strong City and Cottonwood Falls domestic effluents had little or no effect on community structure. Additional studies are needed to: (1) pinpoint the various sources of pollution, (2) determine the

presence of any significant introduction of drift organisms from tributaries, (3) evaluate the effects of the possible introduction of pollutants from tributaries, and (4) determine the direct effect on community of a 'slug' structure moving downstream. (Keel-East Central) W77-11972

HEALTH HAZARDS OF AGRICULTURAL, IN-DUSTRIAL, AND MUNICIPAL WASTES AP-PLIED TO LAND, Universitaet Hohenheim (Landwirtschaftliche

Hochschule). (West Germany). Inst. of Animal Medicine and Animal Hygiene. D. Strauch.

D. Strauch.

In: Land as a Waste Management Alternative,
Proceedings of the 1976 Cornell Agricultural
Waste Management Conference, Ann Arbor
Science Publishers Inc., Ann Arbor, Michigan,
1977, p. 317-342. 7 fig, 10 tab, 34 ref.

Descriptors: Confinement pens, Diseases, Toxicity, Pathogenic bacteria, Nitrates, Phosphates, Water pollution, Groundwater, Slurries, An-tibiotics, Industrial wastes, Sewage, Sewage sludge, Biological treatment, Waste treatment, Farm wastes

Identifiers: Public health, Land disposal, Waste management, Hygiene, Chemical treatment, Physical treatment.

Confinement of animals has increased the number of latent infections in animal production all over the world. The adoption of slurry systems for handling wastes is charged as being largely responsible for this situation. Infective agents occur in the liquid manure and survive the usual stroage time. When the slurry is disposed of on pasture lands, infections may be transmitted to livestock. For an effective interruption of the infection cycles, hygiene on-site treatment of infectious slurry may be necessary before land disposal of the wastes. An additional danger to public health arises when too rge amounts of slurry are distributed on land. Pollution of surface and groundwaters may arise due to infective agents, phosphates, and nitrates. Another hygienic risk for man and animals is the occurence of transmissible resistance of microorganisms caused by feeding antibiotics to improve growth in animal production. Use of newly developed substances which are not resorbed and are said not to cause resistance may solve this problem. Land disposal of industrial wastes may result in toxic organic and inorganic substances which may enter the food chain. High concentrations in plants and food derived from animals can be a health hazard for animals and man. Consequently, the maximum concentrations in soil and plants should be determined and routinely controlled. Land disposal of infected sewage and sewage sludge can cause infections of animals and man. Sewage and sludge should be disinfected before being applied to the land. If this is not feasible, the wastes should only be disposed of on araland and not on pastures and other green fodder areas. Because sewage and sludge also con-tain undesired chemical compounds which may be hazardous to animals and man, the same control measures as for the land use of industrial wastes should be employed. (Merryman-East Central)

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND, Agricultural Research Service, Lincoln, Nebr.

orth Central Region.

J. W. Doran, J. R. Ellis, and T. M. McCalla.

In: Land as a Waste Management Alternative, Proceedings of the 1976 Cornell Agricultural Waste Management Conference, Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1977, p. 343-361. 1 fig, 7 tab, 47 ref.

Descriptors: *Soil microbiology, Sewage, Pathogenic bacteria, Water pollution effects, Groundwater, Ammonification, Nitrification,

Denitrification, Volatilization, Trace elements,

Identifiers: Land disposal, Mobilization, Methyla-

As a result of implementation of the National Environmental Policy Act of 1969 and, more specifically, the respective amendments for the Cle Act and Federal Water Pollution Control Act of 1970 and 1972, land application seems the most feasible means of disposing of animal wastes and domestic sewage wastes. Disease transmission due to this practice is no problem if the wastes have been adequately treated, applied to the land at ac-ceptable rates, and applied in such a way that rapid percolation and runoff are minimized. However, surface and groundwaters should be monitored frequently for indications of fecal contaminat in areas where wastes are applied to land. An important concern in assessment of land application of wastes is the effects of disposal pra microbial processes of decomposition and nutrient cycling. Excessive loading of soils with waste aterials will result in oxygen depletion, slower decomposition, and accumulation of odorous, phototoxic end products that may result in optimal balance between nitrogen removal and reduction in pollution. The stimulation of microbial methylation by wastes added to the soil may be of importance because this transformation can result in the mobilization of many toxic trace elements through volatilization. (Merryman-East Central) W77-11976

PHYSIOLOGICAL CHARACTERISTICS OF MERCURY UPTAKE BY TWO ESTUARINE SPECIES.

Hawaii Univ., Honolulu. Dept. of Zoology For primary bibliographic entry see Field 5B. W77-12007

NITROFURAZONE FOR CONTROL OF THE MICROSPORIDAN PARASITE
PLEISTOPHORA OVARIAE IN GOLDEN

Oklahoma Cooperative Fishery Research Unit. For primary bibliographic entry see Field 5G. W77-12008 Stillwater.

OXYGEN CONSUMPTION BY SPHAERIUM

Kansas State Teachers Coll., Emporia. Div. of Biology. J. Waite, and G. Neufeld.

Comparative Biochemistry and Physiology, Vol. 57A, p 373-375, 1977. 2 fig, 1 tab, 10 ref.

Descriptors: *Invertebrates, *Molluscs, *Clams, *Oxygen, *Oxygen requirements, *Oxygenation, Biochemical oxygen demand, Respiration, Temperature, Mode of action, Bioassay, Thermal stress, Environmental effects.

Identifiers: *Fingernail clam, Sphaerium simile, Tissue analysis, Oxygen consumption.

Oxygen consumption by fingernail clams (Sphaerium simile) was determined as a function of temperature and oxygen tension in both whole organism and excised gill and mantle tissue. The whole organism demonstrated a homeostatic mechanism that resisted gross environmental fluc-tuations. Excised tissue exhibited no regulation of oxygen consumption. (Klein) W77-12009

EFFECTS OF ACUTE CHANGES IN TEMPERA-TURE AND SALINITY ON PULSATION RATES IN EPHYRAE OF THE SCYPHOZOAN AU-

RELIA AURITA,
Texas A and M Univ., College Station. Dept. of Biology. T. M. Dillon.

Marine Biology, Vol. 42, p 31-35, 1977. 3 fig, 2 tab,

Group 5C-Effects Of Pollution

Descriptors: *Invertebrates, *Jellyfish, *Temperature, *Thermal stress, *Salinity, *Resistance, *Osmotic pressure, Aquatic animals, Animal physiology, Water quality, Laboratory tests, Ions, Water properties, Texas, Respiration, Environmental effects, Animal behavior. Identifiers: *Ephyrae, *Aurelia aurita, *Pulsation rates

The response of Aurelia aurita to abrupt tempera-ture and salinity differentials was expressed as changes in bell pulsation rates. Acute temperature changes in bell pulsation rates. Acute temperature rate-responses reflected a reduced temperature sensitivity over a broad range (10 to 35 C), with a Q10 value of 0.97 between 20 and 25C. The initial relationship between salinity change and pulsation rate was linear and direct. This pattern was disrupted after 24h, with those ephyrae experiencing a salinity decrease pulsing significantly faster than those experiencing no change or an increase in salinity. This response to low salinities dis-sipated after 2 days. Holding osmotic pressure constant and disrupting ionic ratios had more of an immediate and persistent effect than solely decreasing salinity. (Klein)

THERAPEUTIC TREATMENT FOR EPIBIOTIC FOULING ON DUNGENESS CRAB (CANCER MAGISTER) LARVAE REARED IN THE LABORATORY,

California Univ., Bodega Bay. Bodega Marine

W. S. Fisher, and R. T. Nelson.

Journal of the Fisheries Research Board of Canada, Vol. 34, p 432-436, 1977. 4 fig, 18 ref.

Descriptors: Invertebrates, *Crabs, *Shellfish, Crustaceans, Larvae, Microbiology, "Algae, "Marine fungi, "Toxicity, "Diatoms, "Fungicides, Toxins, Phytoplankton, Algal toxins, Mortality, Resistance, Larval growth stages, Organic compounds, Mode of action, Bioassay, Laboratory tests

Identifiers: *Dungeness crab, Cancer magister, Phaeodactylum tricornutum, Survival rates, Antibiotics, Bioaccumulation.

This study shows that larvae of the Dungeness crab (Cancer magister) reared in the laboratory are susceptible to epibiotic microbial infestation similar to that described for eggs of the same spe-cies. Larval survival in the laboratory was increased by increased additions of antibiotics to the sea water; however, the chemotherapeutic agent, malachite green, was unsuccessful due to its toxicity to the sensitive larval stages. The addition of the diatom Phaeodactylum tricornutum was beneficial to larval survival in the light but detrimental in dark conditions, supporting the sug-gestion of a photosynthetic excretion from the algae capable of antibiotic activity. (Klein) W77-12011

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - I. ANALYTICAL RESULTS OF THE BLOOD AND BONES, (IN JAPANESE),

Kyushu Univ., Fukuoka (Japan). Dept. of Fishe-

For primary bibliographic entry see Field 5A.

TEMPERATURE PREFERENCES OF FOUR FISH SPECIES IN AN ELECTRONIC THERMOREGULATORY SHUTTLEBOX,

Pennsylvania State Univ., Wilkes-Barre. Dept. of Biology. W. W. Reynolds, and M. E. Casterlin.

The Progressive Fish Culturist, Vol. 39, No. 3, p 123-125, 1977. 1 fig, 17 ref.

Descriptors: *Temperature, *Freshwater fish, *Carp, *Thermal properties, *Resistance, *Thermal stress, *Water temperature, Environ-

mental effects, Fish physiology, Water quality, Sunfish, Fish behavior.
Identifiers: Temperature Identifiers: Temp
*Thermoregulation, *E
pickerel, *Pumpkinseed. Optimum, *Black crappie,

Temperature preferences of four fish species were studied in an electronic thermoregulatory shutthebox. The model temperature preferences of the four species were: black crappie (Poxomis nigromaculatus), 24C; carp (Cyprinus carpio), 29C; chain pickerel (Esox niger), 24C; and pumpkin seed (Lepomis gibbostus), 26C. The species differed in thermoregulatory precision as well as in final preferred temperature, indicating the species-specific nature of thermal behavior. There was lit-

tle intraspecific variation among individuals tested. (Klein)

INVESTIGATIONS ON THE SIMULTANEOUS UPTAKE AND RELEASE OF MERCURY BY DUNALIELLA TERTIOLECTA.

Kiel Univ. (West Germany). Institut fuer Meereskunde.

Marine Biology, Vol. 41, 1977, p 89-97. 5 fig, 26 ref.

Descriptors: Metals, *Mercury, Metabolism, *Phytoplankton, *Algae, Sea water, Path of pollu-tants, Biochemistry, Laboratory tests, *Isotope studies, Chlorophyll, Nutrients, Organic matter, Organic compounds, Dispersion, *Absorption. Identifiers: *Mercury uptake, *Mercury release, Dunaliella tertiolecta, *Radioactive mercury, Isotopes, Hg-203, Chlorophyll a. Descriptors: Metals, *Mercury, Metabolism,

By using two different radioactive mercury isotopes, detailed information was obtained on the uptake and simultaneous release of mercury by Dunaliella tertiolecta. Hg-203 was added to a wellaged culture, which 2 days later was separated from the medium, washed and cultivated again in a fresh medium containing Hg-197. It was found that an exchange of mercury takes place between the cells and the medium. An increase in the concentration of volatile mercury occurs simultaneously with the maximum concentration of chlorophyll a. Comparing the culture solutions with the blanks, the dissolved mercury shows similar volatility. This leads to the assumption that the main part of the dissolved mercury in the culture solutions is in the inorganic state. (Katz) W77-12014

ORGANOCHLORINES AND HEAVY METALS IN THE HARBOUR SEAL PHOCASVITULINA FROM THE GERMAN NORTH SEA COAST, Kiel Univ. (West Germany). Institut fuer Haustier-

H. E. Drescher, U. Harms, and E. Huschenbeth. Marine Biology, Vol. 41, 1977, p 91-106, 2 tab, 2

fig. 16 ref.

Descriptors: *Chlorinated hydrocarbons, *Metals, *Arochlor, *Polychlorinated biphenyls, Copper, Zinc, Mercury, Cadmium, Lead, DDT, *Dieldrin, Seals, *Mammals, Juveniles, Biochemistry, Animal physiology, Pathology, Water pollution ef-

Identifiers: *Lindane, *Harbour seals, Phoca vitu-lina, *North Sea, Tissue concentrations, Or-ganochlorine residues, German Coast.

Samples of various tissues and organs from Samples of various ussues and organs from healthy, sick and dead harbour seals (Phoca vitulina) from the North German Waddensea collected during the years 1974-1976 were analyzed for copper, zinc, total mercury, cadmium, lead, and organochlorine pesticide residues (PCB, DDT, Lindane, and Dieldrin). There was great variation within all series of compounds investigated, but in general the analytical data obtained indicated that high amounts of heavy metals and organochlorine pesticides can be present even in young seals. An age-specific increase in the mercury and cadmium content in liver samples could be demonstrated. content in liver samples could be demonstrated. The results are compared with data published by British and Dutch authors for other North Sea regions, and with a few exceptions, no significant differences can be established: cadmium (kidney) and DDT (blubber) contents in areas off the British coast are usually higher than corresponding values for seals from the German coast. There was no clear evidince that the concentrations of any of the compounds investigated had negative effects on the health of the seals. However, possible com-bined effects cannot be excluded. (Katz)

DETECTION OF TRACE CONTAMINANT EFFECTS IN AQUATIC ECOSYSTEMS, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 5A. W77-12017

ORGANOCHLORINE RESIDUES IN MATER-NAL BLUBBER, MILK, AND PUP BLUBBER FROM GREY SEALS (HALICHOERUS GRYPUS) FROM SABLE ISLAND, NOVA

SCOTIA, Bedford Institute of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab. For primary bibliographic entry see Field 5B. W77-12019

EARLY DEVELOPMENTAL EFFECTS OF LIME NEUTRALIZED IRON HYDROXIDE SUSPENSIONS ON BROOK TROUT AND COHO

SALMON, Army Engineer District, Pittsburg, Pa. E. J. Smith, and J. L. Sykora.

Transactions of the American Fisheries Society, Vol 105, No 2, p 308-312, 1976. 3 tab, 13 ref.

Descriptors: *Salmonids. *Trout. *Brook Trout, *Iron Compounds, *Chemical reactions, *Lime, *Fish eggs, *Immature growth stage, tions, *Lime, *Fish eggs, *Immature growth stage, Inorganic compounds, Fish physiology, Metals, Growth rates, Water quality, Mortality, Bioassay, Resistance.

Identifiers: *Coho salmon, *Alevins, *Lime neutralized iron hydroxide suspensions, Survival

A study of the effect of lime-neutralized iron hydroxide suspensions on eggs and alevins of brook trout (Salvelinus fontinalis) and coho salmon (Oncorhynchus kisutch) was conducted with a modified proportional diluter. Effects were interpreted from data on hatchability, survival, and growth in five test concentrations and control. Growth of 90-day-old coho salmon alevins was reduced in water containing 1.27 mg Fe/liter of lime-neutralized suspended iron, whereas hatcha-bility was unaffected in the highest concentration tested, 10.5 mg Fe/liter. However, 10.5 mg Fe/liter water had no measureable effect on hatchability, survival, and growth of brook trout alevins. The safe upper limit of lime-neutralized suspended iron for hatchability, survival, and growth of coho sal-mon alevins may lie between 0.97 and 1.27 mg Fe/liter. (Klein) W77-12020

STUDIES ON THE CULTIVATION OF MARINE CLADOCERA - I. FACTORS AFFECTING THE HATCH OF RESTING EGGS, (IN JAPANESE), Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.

H. Iwasaki, A. Takami, and T. Onbe Bulletin of the Plankton Society of Japan, Vol 24, No 1, p 62-65, 1977. 3 fig, 2 ref.

*Environmental Descriptors: *Temperature, *Fish eggs, *Light intensity, *Hatching, Growth stages, Water quality, Fish physiology, Crustacea, Zooplankton aquiculture, Fish farming, Fish diets, *Salinity. Identifiers: *Hatching rates, *Cladocera sp.,

Environmental factors affecting the hatch of resting eggs of marine Cladocera were examined. The resting eggs of Penilia avirostris, Evadne sp., Podon sp., hatched in a wide range of chlorinity and light intensity. The highest hatching rate was obtained at 1,000 lux. In P. avirostris the highest hatching rate was observed at 14.1% Cl at 18C. In Podon sp. otimal chlorinity and temperature values measured 10.6% Cl and 15C, respectively. Hatching rates tended to increase with the lowering of temperature within a range from 15-21C. Optimal conditioning for Evadne sp. eggs were similar to those of Podon sp. (Katz) W77-12021

EFFECTS OF SALINITY ON THE NET UPTAKE OF ZINC BY THE COMMON MUSSEL MYTI-

LUS EDULIS, Melbourne Univ., Parkville (Australia). Dept. of

D. J. H. Phillips.

Marine Biology, Vol 41, 1977, p 79-88. 3 tab, 5 fig,

Descriptors: Metals, *Zinc, Molluscs, *Mussels, Water pollution effects, Path of Pollutants, Com-mercial shellfish, *Salinity, Seawater, Stress, Estuaries, Trace elements, Australia, Laboratory tests, Clinical analysis, *Cadmium, *Copper. Identifiers: *Metal uptake, Net uptake, Stable salinity, Fluctuating salinity, Tissue analysis, Con-

The net uptake of zinc by the common mussel Mytilus edulis (L.) has been investigated under different natural and artificial salinity stresses. The effects of stable and fluctuating salinities on the uptake of zinc by the mussel are discussed in terms of three possible modes of action. Under certain highly-stressful conditions, salinity may affect the uptake of zinc by the mussel. This factor should be considered when the mussel is used as an indicator of environmental pollution by zinc in estuarine areas, or spurious conclusions may result. (Katz)

DIEL VARIATIONS IN SENSITIVITY OF FISHES TO POTENTIALLY LETHAL STIMULI, Milwaukee Public Museum, Wis. R. Spieler, T. A. Noseke, and G. L. Seegert. The Progressive Fish Culturist, Vol 39, No 3, p 144-147, 1977. 1 fig, 2 tab, 22 ref.

Descriptors: *Thermal stress, *Temperature, *Toxicity, *Chlorine, *Organic compounds, *Minnows, *Shiners, *Time, Fish physiology, Lethal limits, Water pollution, Resistance, Bioassay, Toxins, Mortality, Biorhythms. Identifiers: *Formalin, Time-of-day, *Golden shiners, Fathead minnows, *Lethal stimuli, *Diel variations, Sensitivity, Pimephales, Notemigonus.

Fathead minnows (Pimephales promelas) and golden shiners (Notemigonus crysoleucas) exhibited differences in sensitivity to potentially lethal levels of chlorine, formalin, or heat, depending on the time of day of treatment. (Klein) W77-12023

EFFECTS OF SALTON SEA WATER ON THE EGGS AND LARVAE OF BAIRDIELLA ICISTIA (PISCES: SCIAENIDAE),

Hawaii Inst. of Marine Biology, Honolulu.

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R. C. May. California Fish and Game, Vol 62, No 2, p 119-131, 1976. 5 fig, 5 tab, 27 ref.

Descriptors: Larvae, *Larval growth stage, *Mortality, *Salinity, Saline water, *Ions, *Salt tolerance, Lethal limit, Toxicity, Laboratory tests, Embryonic growth stage, Growth rates, Bioassay, *Saline Lakes, California.

*Sciaenidae, rates. Identifiers: Survival Bairdiella icistia, *Salton Sea, Ionic composition.

In laboratory experiments, eggs and early larvae of the sciaenid fish Bairdiella icistia survived well in sea water but displayed extremely poor survival in water from the Salton Sea. Mortality in Salton Sea water was expressed mainly among hatched larvae prior to complete yolk absorption. Experiments conducted in both natural and artificial sea water and Salton Sea water indicated that this poor survival was related to the unusual inoic composition of the Salton Sea. (Katz) W77-12025

DEVELOPMENT OF ATLANTIC SALMON (SALMO SALAR) EGGS AND ALEVIT'S UNDER VARIED TEMPERATURE REGIMES, Fisheries and Marine Service, St. Andrews (New

Brunswick). Biological Station. R. H. Peterson, H. C. E. Spinney, and A.

Sreedharan.

Journal of the Fisheries Research Board of Canada, Vol 34, p 31-43, 1977. 7 fig, 8 tab, 15 ref.

Descriptors: *Temperature, *Thermal stress, *Resistance, *Salmonids, *Fish physiology, *Salmon, *Atlantic salmon, Mortality, *Fish eggs, Juvenile growth stage, Bioassay, Immature growth stage, Fish behavior. Identifiers: *Alevins.

Atlantic salmon (Salmo salar) eggs and alevins were raised under conditions where the temperature was systematically varied either at fertilization, at the eyed egg stage, or at hatching. Mortality was more than 20% in eggs started immediately after fertilization at constant incubation temperatures less than 4C as compared with 5% or less at temperatures more than 4C. Alevins that eyed at and higher were progressively small higher the temperature. The optimum temperature from fertilization to eye pigmentation was near 6C. Eyed eggs reared at lower temperatures until hatching were larger than those hatched at higher temperatures. This size differential was maintained until the yolk was completely absorbed at all posthatching temperatures investigated. Sudden decreases in temperature at the eyed egg and hatching stages induced severe edema of the alevin yolk sac, resulting in slower growth and increased mortality. (Klein)

HEAVY-METAL CONTAMINATION BY AT-MOSPHERIC FALLOUT OF SEVERAL FLIN FLON AREA LAKES AND THE RELATION TO

FISH POPULATIONS,
Toronto Univ. (Ontario). Dept. of Geology,;
Toronto Univ. (Ontario). Dept. of Chemistry; and Toronto Univ. (Ontario). Inst. for Environmental Studies and Engineering.
For primary bibliographic entry see Field 5B.

W77-12027

INFLUENCE OF WAT 'R TEMPERATURE ON THE GROWTH RATE OF THE LANDLOCKED SEA LAMPREY (PETROMYZON MARINUS) AND THE ASSOCIATED RATE OF HOST MOR-TALITY

Guelph Univ. (Ontario). Dept. of Zoology.
G. J. Farmer, F. W. H. Beamish, and P. F. Lett.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1373-1378, 1977. 2 fig, 1 tab, 23

Descriptors: *Growth rates, *Toxicity, *Water temperature, *Lampreys, *Suckers, Freshwater fish, *Thermal stress, *Fish parasites, *Mortality, Seasonal, Environmental effects, Teleosts, Heat resistance, Fish populations.
Identifiers: *Sea lampreys, Petromyzon marinus,

*White suckers, Catostomus commersoni, Hosts.

Groups of sea lampreys (Petromyzon marinus) of 10-90 g initial weight were held at temperatures of 1-20C for 30 days and allowed to feed ad lib, on white suckers (Catostomus commersoni). In-creases in water temperature and in lamprey size caused the rate of host mortality to increase in agreement with observations that mortality in the Great Lakes is seasonal. Instantaneous growth rates were maximal at 20C for lampreys of 10-30 g, the optimal temperature for growth shifting to 15C for larger lampreys of 30-90 g. Growth rates were intermediate at 10C and lowest at 4C for lampreys of all size. Accordingly, host mortality increased with temperature over the 4-20C range. At all experimental temperatures, increases in lamprey weight were accompanied by an exponential decline in instantaneous growth rates, a phenomenon also observed for teleosts. Laboratory growth rates at temperatures of 5-15C were comparable to rates observed for lampreys in Lake Huron between April and November and agree with the observation that lampreys feed in deeper waters between April and June before moving to warmer, shallower waters during the summer when growth rate increases. (Katz) W77-12028

WHITE SUCKER (CATOSTOMUS COMMER-SONI) EMBRYO DEVELOPMENT, AND EARLY GROWTH AND SURVIVAL AT DIFFERENT TEMPERATURES,

Environmental Research Lab.-Duluth, Minn. J. H. McCormick, B. R. Jones, and K. E. F.

Journal of the Fisheries Research Board of Canada, Vol 34, p 1019-1025, 1977. 1 fig, 3 tab, 21

Descriptors: *Growth rates, *Growth stages, *Life cycles, *Embryonic growth stage, *Larval growth stage, *Water temperature, *Suckers, Biomass, Environmental effects, Mortality, Fish population, Fecundity, Analytical techniques. Identifiers: *White sucker, Catostomus, *Thermal response, TL50, Spinal deformities.

White suckers were exposed from fertilization through hatching to seven constant temperatures from 6.2 through 24.1C. High percentages of ap-parently normal larvae hatched at temperatures from 9.0 through 17.2C. Maximum percent hatch occurred at 15.2C, while only a few normal larvae were produced at 6.2C and none at 24.1C. Growth rates increased from near zero at 10.0C to a maximum at 26.9C. At 29.7C growth fall below the maximum (P 0.05), and the incidence of spinal deformities was high. Death rates were uniformly low from 15.7 to 26.9C and were significantly higher at 10.0 and 29.7C (P 0.05). The rate of net biomass gain for test groups was maximum at 26.9C. Net rates of biomass gain declined progressively with temperatures below 26.9C until by 10.0C the rate of population growth became less than the rate of weight loss through deaths within than the rate of weight loss through deaths with the population. The temperature producing max-imum hatching success, 15C, was nearly 12C lower than that providing for maximum growth and net biomass gain. This variation in optimal temperature during the life stages of the white sucker reflects the changes in preferred environment seen under natural conditions. The importance of maintaining seasonal temperature cycles, access to native spawning sites, and access to thermal retreats during periods of excessive temeratures becomes apparent. (Katz) W77-12030

EFFECT OF SHOCK EXPOSURES OF CHLORINE ON THE PLASMA ELECTROLYTE CONCENTRATIONS OF ADULT RAINBOW TROUT (SALMO GAIRDNERI),

Consumers Power Co., Jackson, Mich. Dept. of Environmental Services.

I. H. Zeitoun, L. D. Hughes, and D. E. Ullrey. Journal of the Fisheries Research Board of Canada, Vol 34, p 1034-1039, 1977. 3 tab, 19 ref.

Group 5C-Effects Of Pollution

*Rainbow trout, *Chlorine. Descriptors: Descriptors: "Rainbow trout, "Chlorine, *Electrolytes, Powerplants, Phosphorus, Mag-nesium, Copper, Zinc, Potassium, Calcium, Sodi-um, Salmonids, Toxicity, Environmental effects, Lethal limit, Chemical analysis, Bioassay.

Identifiers: Plasma, *Plasma electrolytes,
*Hemolysis, *Mineral homeostasis, Hematology,
Toxicology, Biocide.

Blood was pooled from randomly selected 3-yr-old rainbow trout before addition of chlorine to their water environment and afterward when fish began to gulp for air and lose equilibrium. In five duplicate tests, plasma concentrations of phosphorus, magnesium, iron, copper, zinc, and potassium increased substantially in the stressed fish. Calcium concentration was also higher, but not significantly so in the plasma of the test fish as compared with those of the controls. Sodium was the only electrolyte that dropped substantially (p < 0.01) in the test fish as compared with the controls. Chlorine toxicity appeared to disturb the mineral homeostasis in the fish blood. Rapid recruitment of electrolytes from the environment and movement into the plasma, a strong mineral retention mechanism, or mobilization of body mineral stores worked together or individually to compensate for those minerals lost with water during hemoconcentration. (Katz) W77-12031

DISTRIBUTION AND DEGRADATION OF DINITROANILINE HERBICIDES IN AN AQUATIC ECOSYSTEM,

Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst. For primary bibliographic entry see Field 5B. W77-12032

ABNORMAL TERNS, SICK SEA AND SHORE BIRDS, ORGANOCHLORINES AND BOVIRUSES IN THE INDIAN OCEAN, Aberdeen Univ. (Scotland). Seabird Group

W. R. P. Bourne, J. A. Bogan, D. Bullock, A. W. Diamond, and C. J. Feare.

Marine Pollution Bulletin, Vol 8, No 7, p 154-158, 1977. 2 tab, 23 ref.

Descriptors: *Polychlorinated biphenyls, *DDE, *Organic pesticides, *Viruses, *Carriers, Environmental effects, Animal growth, Water pollution effect, Diseases, Epidemiology, Shore birds, Water birds, Indian Ocean. Identifiers: *Arboviruses, *Terns, *Teratology, Congenital abnormalities, Ticks.

It has been suggested that congenital abnormalities and defects of feather growth of young terns along the east coast of the USA may be due to or-ganochlorine pollution. Similar abnormalities are also found in young terns and neurological symptoms in terns and other species in the Indian Ocean, where there is still little pollution, in association with an acute infestation of ticks infected with arboviruses. It is postulated that infection with the viruses provides an alternative explanation for the abnormalities seen in the birds. (Katz) W77-12034

CHLORINATED COOLING WATERS IN THE MARINE ENVIRONMENT: DEVELOPMENT OF EFFLUENT GUIDELINES,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5G. W77-12036

DETERMINATION OF MERCURY IN FISH FROM RIVERS AND LAKES IN HUNGARY BY ATOMIC ABSORPTION TECHNIQUE, Institute of Nutrition, Budapest (Hungary For primary bibliographic entry see Field 5A.

EFFECTS OF HEAVY METALS (CADMIUM, COPPER, CHROMIUM AND LEAD) ON A FRESHWATER SNAIL, BIOMPHALARIA GLABRATA SAY (GASTROPODA, PROSOBRANCHIA), Commission of the European Communities, Ispra

(Italy). Joint Research Centre. O. Ravera.

Malacologia, Vol 16, No 1, p 231-236, 1977. 4 fig, 1 tab 7 ref.

Descriptors: *Heavy metals, *Cadmium, *Copper, *Chromium, *Lead, *Lethal limit, Fertility, Fecundity, Gastropods, *Embryonic growth stage, *Mortality, Laboratory animals, Toxicity, Mollusks, Growth rates, Growth stages, Laborato-

ry tests, *Snails.
Identifiers: Sublethal effects, Biomphalaria,
Freshwater pulmonates, Pulmonates.

This study concerns the effects of heavy metals on the mortality and fecundity of the adult snails and the viability of their embryos. Embryos were also tested for lead. The concentrations used ranged from 0 ppm th 4.0 ppm for cadmium and copper and from 0 to 1.4 ppm for chromium. Cadr and copper were far more toxic than chromium. Fertility was abolished by 0.1 ppm of cadmium and copper and fecundity was severely affected by chromium. Some evident sublethal effects were observed. Survival of the hatchlings treated with chromium was of the same order of magnitude as that of the controls and sexual maturity did not show any delay. Forty-one percent of the embryos kept at concentrations of 0.1 ppm lead completed their development in 51 days, that is, with a delay of 37 days. The hatchlings at 0.1 ppm died after 15 days. The advantages of using freshwater pulmonates as a toxicity test was discussed. (Katz) W77-12038

POWER PLANTS AND PLANKTON, Scripps Institution of Oceanography, La Jolla, Calif J. T. Enright.

Marine Pollution Bulletin, Vol 8, No 7, p 158-161, 1977. 2 fig, 7 ref.

Descriptors: *Mortality, *Powerplants, *Electric powerplants, *Cooling water, *Thermal stress, *Heated water, *Plankton, *Mathematical models, *Larval growth stage, *Entrainment, Environmental effects, Water pollution sources, Statistical methods, Analytical techniques, Population, Aquatic populations, Density, Thermal pollution. Identifiers: *Population dynamics

The use of coastal oceanic waters in the cooling systems of power plants leads to the destruction of large numbers of planktonic larvae of nearshore fish and invertebrates. As a first-order approach toward assessing the maximum probable impact of such larval mortality upon adult populations, one can assume that recruitment to local populations is due to larvae from distant sources, which have a recruitment success independent of adult density; and that adult mortality is density-independent. These worst-possible-case assumptions lead to the interpretation that impact on adult populations could be adequately evaluated by measuring-or predicting-the power-plant imposed reductions in larval density in those nearshore waters from which recruitment occurs. (Katz) W77-12039

SURVIVAL TIME AND LETHAL EXPOSURE TIME FOR THE BLACKNOSE DACE EXPOSED TO FREE CHLORINE AND CHLORAMINES, Maryland Univ., College Park, Inland Environ-

J. A. Tompkins, and C. Tsai. Transactions of the American Fisheries Society, Vol 105, No 2, p 313-321, 1976. 4 fig, 5 tab, 16 ref.

Descriptors: *Lethal limit, *Freshwater fish, *Resistance, *Time, *Chlorine, *Toxicity, Toxins,

Chlorination, Mortality, Fishkill, Bioassay, Laboratory tests, Water quality, Analytical techniques, Water pollution effects. Identifiers: "Chloramines, "Amines, Time of ex-posure, Survival rates, "Blacknose dace, "Survival time, Rhinichthys atratulus, Chlorine

Survival time and lethal exposure time were determined by continuous flow bioassay for blacknose dace, Rhinichthys atratulus, exposed to four concentrations each of free chlorine solutions and of chloramine solutions. For the concentrations tested, the lethal exposure time, a period of minimum exposure time of the fish in the test solu-tions to carry a toxic process to a point where recovery is no longer possible, was found to be shorter than the survival time, a period from the time of immersion to the time of death of the fish in the test solutions. The difference between the mdian lethal exposure time and median survival time decreased with a decrease in total chlorine concentrations. Using either the median survival time or median lethal exposure time as the toxicity index, chloramines were more toxic than free chlorine to the blacknose dace at high concentrations, but less so in low concentrations. (Klein) W77-12040

CHLORINE DISSIPATION AND TOXICITY PRESENCE OF NITROGENOUS COMPOUNDS Florida Inst. of Tech., Melbourne. Dept. of Oceanography.

Journal Water Pollution Control Federation, Vol 49. p 1627-1635, 1977, 13 fig, 8 ref.

Descriptors: *Toxicity, *Organic compounds, *Chlorine, *Nitrogen compounds, Light, Mode of action, Amino acids, Ureas, Water quality, Fish toxins, *Bioassay, Path of pollutants, Water pollution effects, Mortality, Phosphorous compounds, *Phosphorous compounds, *Phosphorous compounds, *Phosphorous casts* Laboratory tests.

Identifiers: Chlorine dissipation, Nucleotides, Phosphocreatine, Bioaccumulation, Sunlight, Gambusia.

Eighteen amino acids, 3 nucleotides, phosphocreatine, and urea were the nitrogenous compounds selected for the determination of chlorine dissipation in relation to toxicity prior to and after the addition of fish, Gambusia affinis, to and arter the addition of rish, cambusia artims, to water tanks. The toxicities of the organic com-pounds, which were much less than that of free chlorine, varied directly with the log of fish mor-tality and the slope of chlorine dissipation in the presence of fish. The nitrogenous compounds al-tered the toxicity of total residual chlorine. In the presence of sunlight, some of the compounds com-bining clorine residues were stabilized, decreasing tota toxicity values. (Klein) W77-12042

INFLUENCE OF POLYPHENOLS AND QUIN-ONES ON AQUATIC PLANTS AND THEIR BLOCKING OF SH-GROUPS, Irkutskii Gosudarstvennyi Universitet (USSR). Scientific Research Inst. of Biology.

Acta Hydrochimica et Hydrobiologiea, Vol 5, No 3, p 291-298, 1977. 1 fig, 3 tab, 22 ref.

Descriptors: *Aquatic plants, *Plant physiology, *Metabolism, *Mode of action, *Chemical reactions, *Chemical properties, *Biochemistry, *Organic compounds, *Phenols, Industrial wastes, Water pollution sources, Path of pollutants, Toxicity, *Industrial *Industrial** icity, Analytical techniques, Phenolic compounds. Identifiers: Biochemical mechanisms, *Quinones, Mechanism of action, *SH-groups, *Sulfhydrylgroups, Nitella sp., Dunaliella sp., Elodea sp., Tissue analysis.

The influence of dioxybenzenes and their quin-ones on Dunaliella salina, Nitella sp. and Elodea canadensis was investigated. It was established

that the higher the rate of polyphenol oxidation by the aqueous plants, the higher the toxicity of the compound being studied is and the larger the reduction of the SH-group content due to the incu-bation of plants in these polyphenol solutions is. The conclusion is drawn that a higher degree of toxicity to the aquatic plants of pyrocatechol and hydroquinone, in comparison with other phenols, is due to their ability to oxidize phenols to quin-ones. It is suggested that one of the possible biochemical mechanisms for demonstrating the toxic station of the phenol oxidation products is the blocking of SH-groups. (Klein)

BHC RESIDUES OF DOMESTIC ORIGIN: A SIGNIFICANT FACTOR IN POLLUTION OF FRESHWATER IN NORTHERN IRELAND, Queen's Univ., Belfast (Northern Ireland) Dept. of Agricultural and Food Chemistry. For primary bibliographic entry see Field 5B. W77-12046

RETENTION OF MERCURY IN THE MUSCLE OF YELLOW PERCH (PERCA FLAVESCENS) AND ROCK BASS (AMBLOPLITES RUPES-

TRIS), Institute for Fisheries Research, Ann Arbor, Mich. Fisheries Div. For primary bibliographic entry see Field 5B.

LONG-TERM CADMIUM STRESS IN THE CUNNER, TAUTOGOLABRUS ADSPERSUS, National Marine Fisheries Service, Milford, Conn. Milford Lab.

J. R. MacInnes, F. P. Thurberg, R. A. Greig, and

Fishery Bulletin, Vol 75, p 199-204, 1977. 3 tab, 27

physiology, Biochemistry, Descriptors: *Metals, *Fish *Toxicity, *Respiration, Biochemistry, *Enzymes, *Mode of action, *Teleosts, Bioassay, Absorption, Water pollution sources, Aquatic life, Lethal limit, Resistance, Water pollution effects, Mortality, Oxygen requirements, Environmental effects, *Cadmium.

Identifiers: *Cunner, Tissue analysis, Cadmium stress, Tautogolabrus adspersus.

The cunner, Tautogolabrus adspersus, was exposed for 30 and 60 days to 0.05 or 0.10 ppm Cd as cadmium chloride. The mean gill-tissue respiratory rates exhibited by the control fish and those exposed to 0.05 and 0.10 Cd were 972, 736, and 665 micro-1 O2/h.g dry weight, respectively, after 30 days and 1,036, 702, and 587 micro-1 O2 h.g, respectively, after 60 days. Changes were also observed in the activities of two liver enzymes, aspartate aminotransferase (depression) and glucose-6-phosphate dehydrogenase (induction). Results are compared with those from other metal-exposure studies with cunners and other teleosts. (Klein) W77-12048

TANNIN AS AN AGENT TO ELIMINATE AD-HESIVENESS OF WALLEYE EGGS DURING ARTIFICIAL PROPAGATION,

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Southeastern Senior Coll., Juneau, Alaska. Div. of

For primary bibliographic entry see Field 5G.

A MASSIVE KILL OF POND-REARED MACROBRACHIUM ROSENBERGII, Malaya Univ., Kuala Lumpur (Malaysia). Dept. of

P. Green, T. L. Richards, and T. Singh.

Aquaculture, Vol. 11, p 263-272, 1977. 2 fig., 4

Descriptors: "Shellfish, "Oxygen demand, "Oxygen requirements, "Crustaceans, "Ponds, "Water pollution sources, "Fertilizers, Runoff, Rainfall, Animal physiology, Environmental effects, Water quality, Algae, Algal poisoning, Mortality, Water properties, Population, Growth rates, Path of pollutants.

Identifiers: "Prawns, "Macrobrachium rosenbergii"

Pond culture of Macrobrachium rosenbergii was progressing satisfactorily until reduced oxygen concentration killed 45% of the prawns within a 10day period. A concentration of over-fertilization of the pond water with a mash-type supplemental food, bottom turnover due to heavy rains and an algal bloom led to this kill. Analysis of a 600-prawn sub-sample provided information on growth and population structure. (Klein) W77-12050

TEMPERATURE TOLERANCES AND UPPER LETHAL LIMITS OF SALMO APACHE, Midwest Research Lab., Kansas City, Mo.

Transactions of the American Fisheries Society, Vol. 105, No. 2, p 294-299, 1976. 1 tab., 4 ref.

Descriptors: *Temperature, *Resistance, *Thermal stress, *Salmonids, *Trout, *Lethal Descriptors: limit, *Toxicity, Fish physiology, Fish behavior, Growth stages, Mortality, Feeding rates, Bioassay, Laboratory tests.

Identifiers: *Arizona trout, *Salmo apache,

*Fingerlings, Endangered species.

Fingerlings of the endangered trout species Salmo apache Miller were subjected to increasing temperatures to determine upper lethal temperature limits. Most fish refused to take food at temperatures above 20C. Equilibrium loss occurred between 21.2 and 22.3C. Death occurred when temperatures exceeded 23C. (Katz) W77-12052

LONG-TERM FLUCTUATIONS OF EPIBENTHIC FISH AND INVERTEBRATE POPULATIONS IN APALACHICOLA BAY, FLORIDA, Florida State Univ., Fla. Dept. of Biological

R. J. Livingston, G. J. Kobylinski, F. G. Lewis, III, and P. F. Sheridan.

Fishery Bulletin, Vol. 74, No. 2, p 311-322, 1976. 6 fig., 3 tab., 39 ref.

Descriptors: Populations, *Fluctuations, *Biota, Ecotypes, *Fishes, *Invertebrates, *Distribution patterns, *Dominant organisms, Turnover, Aquatic life, Salinity, Turbulence, Nutrients, Detritus, *Florida, Reproduction, Biorhythms, Niches, Annual, Benthic fauna, Bays, Gulf of Mexico.

Identifiers: *Epibenthic fish, Species-specificity, *Apalachicola Bay(Fla).

A 3-yr study was made concerning seasonal changes in the biota of Apalachicola Bay. The Apalachicola River causes a temporal progression of changes of various environmental parameters in the bay such as salinity, turbidity, nutrients, and detritus levels. Fishes were more widespread in their distribution throughout the bay than inver-tebrates. This was thought to be related to trophic response and habitat preference. High levels of relative dominance prevailed for both groups with the top three species of each group accounting for more than 80% of the total number of individuals taken. Peak levels of monthly abundance of various dominant fish species tended not to overlap through a given 12-mo period. Invertebrate species abundance usually reached peak levels during summer and fall periods. The seasonal appearance and distribution of organisms in the Apalachicola Bay system was comparable to that found in other estuaries in the northern Gulf of Mexico. The temporal and spatial distribution of estuarine fishes and invertebrates was associated with speciesand inverteenacy was associated with species, specific reproductive cycles, trophic relationships, and habitat preferences. The Apalachicola estuary was viewed as a seasonally stable system, with regular temporal fluctuations of the biota through each annual cycle. (Klein) W77-12053

EFFECT OF PH ON TOLERANCE OF HOR-MIDIUM RIVULARE TO ZINC AND COPPER, Durham Univ. (England). Dept. of Botany. J. W. Hargreaves, and B. A. Whitton. Oecologia, Vol. 26, p 235-243, 1976. 6 fig., 1 tab.,

Descriptors: *Algae, *Toxicity, *Metals, *Hydrogen ion concentrations, *Zinc, *Copper, Resistance, *Acid streams, Population, Path of pollutants, Growth rates, Streams, Water quality, Calcium, Mine drainage, Water pollution effects. Identifiers: *Hormidium rivulare, pH range, Op-

The toxicity of zinc to a population of a common stream algae, Hormidium rivulare, isolated from an acid mine drainage was shown to be least at the optimum pH range for the growth of the algae, pH 3.5-4.0; toxicity markedly increased at higher pH values. Calcium antagonized the toxicity of zinc. Populations of H. rivulare, isolated from higher pH conditions and resistant to zinc, were especially resistant to low pH values. Raised levels of Ca incurred only a slight improvement of growth at very low pH values in the absence of zinc, indicating that the mechanism of pH and Zn tolerance were dissimilar. Although the acid stream population grew in the field in an environment with similar levels of Zn and Cu. Cu was less toxic than Zn at pH 3.5, but much more toxic at pH W77-12054

EFFECT OF PULP MILL EFFLUENT ON THE SURFICIAL SEDIMENTS OF WESTERN NIPIGON BAY, LAKE SUPERIOR, Canada Centre for Inland Waters, Burlington

(Untario). R. G. Sandilands. Journal of the Fisheries Research Board of Canada, Vol. 34, No. 6, p 817-823, 1977. 5 fig., 2

Descriptors: *Sediments, *Pulp wastes, *Sampling, *Lake sediments, *Bottom sediments, *Chemical wastes, *Effluents, Hydrogen ion concentration, Sediment distribution, Industrial wastes, Water pollution effects, Water pollution sources, Sulphur, Mercury, Distribution patterns, Soil analysis, *Lake Superior, Particle size, Identifiers: *Nipigon Bay(Ontario).

tom sediment samples were obtained in June 1974 to determine the zone of influence of a point source discharge from the kraft paper mill at Red Rock, Ont. The composition of the samples were described by particle-size distribution, organic and inorganic carbon, major elements and trace element analyses. Correlation coefficients and cluster analysis were used to determine any characteristic associations. The results showed that the mill discharge decreased pH and increased organic matter in the sediment. Above average concentrations of total sulphur and mercury appeared to be associated with this organic matter. These effects were localized around the point source (1.5 km) and were detectable to about 5 km downstream from the mill outfall. W77-12055

ACUTE TOXICOLOGICAL RESPONSE OF THE CRAYESH (ORCONECTES LIMOSUS) TO

Mentclair State Coll., Upper Montclair, N. J. Dept. of Biology.

Group 5C-Effects Of Pollution

M. Doyle, S. Koepp, and J. Klaunig. Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 422-424, 1976. 1 fig., 1 tab., 5 ref.

*Toxicity. Descriptors: *Mercury, *Mortality, *Toxicity, *Crayfish, *Chlorides, Metals, Path of pollutants, Environmental effects, Population, Water quality, Heavy metals, Growth stages, Absorption, Bioassay, Invertebrates.

ntifiers: Bioaccumulation, Orconectes limosus, *Mercuric chloride.

The dose-response of a single population (Orconectes limosus) to mercuric chloride as a preface to histopathological studies was investigated, 100% survival was obtained at a dosage of 0.25 mg/1. Survivors of the calculated LD-60 (1.0 mg/1) exhibited sluggish responses to mechanical stimulation, whereas only occasional ventilative movements characterized crayfishes surviving higher dosages. The decrease in percent survival was proportional to both time and toxicant concentration, with the greatest mortality occurring between 24 and 72 hours. (Katz) W77-12056

THE FEEDING BEHAVIOR OF MYTILUS EDU-LIS IN THE PRESENCE OF METHYLMERCU-RY ACETATE.

Texas A and M Univ., College Station. Dept. of Biology. P. Dorn.

Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 6, p 714-719, 1976. 1 fig., 3 tab., 19 ref.

Descriptors: *Mercury, *Metals, *Organic compounds, *Animal behavior, *Mussels, *Diatoms, *Feeding rates, Productivity, Food habits, Benthic fauna, Invertebrates, Mortality, Environmental effects, Path of pollutants.

Identifiers: *Feeding behavior, *Methylmercury

The effects of sublethal levels of methyl mercury upon the feeding behavior of a filter feeding bivalve, Mytilus edulis, was investigated. The results of feeding M. edulis in control conditions showed that the mussels were capable of ingesting and retaining large amounts of diatoms (Nitzschia) ranging from 145-34,045 cells per day. All concentrations of methyl mercury resulted in decreased feeding - as the toxicant level increased, feeding decreased. (Katz) W77-12057

PULP AND PAPER MILL EFFLUENT IN A FRESHWATER ENVIRONMENT, Canada Centre for Inland Waters Burlington (Ontario).

For primary bibliographic entry see Field 5B. W77-12059

A QUANTITATIVE STUDY OF THE INVERTEBRATE FAUNA OF THE RIVER TEES BELOW COW GREEN RESERVOIR,

Freshwater Biological Association, Cumbria (England). Cow Green Lab. P. D. Armitage

Freshwater Biology, Vol 6, No 3, p 229-240, 1976. 5 fig, 5 tab, 34 ref

Descriptors: *Invertebrates, *On-site data collections, *Biomass, *Benthic fauna, Zooplankton, Phytoplankton, *Environmental effects, Water control, Sampling, Statistical methods, Analytical techniques, Mollusks, Life history studies, Dams,

Methodology.

Identifiers: Tees River(England), *Cow Green

Monthly samples were taken in the River Tees below Cow Green dam from four sites differing in flow conditions, by means of trays containing stones from the river, which were immersed for a period of 1 month. Information on the distribution, abundance and biomass of the benthos of the River Tees is given with additional data on the lifehistories of some of the more common species, during the period May 1971 to May 1972. The com-position and distribution of the fauna was discussed. It was suggested that the relative richness of the fauna in terms of biomass was attributable to the organic enrichment of the river following the building of the Cow Green dam. The regulation of the flow has allowed the dense growth of algae and mosses, and the development of large molluscan populations, and the reservoir itself provides a rich source of food, particularly zooplankton and phytoplankton, for the river benthos. (Katz) W77-12060

THE UPTAKE AND INTERORGAN DISTRIBU-TION OF MERCURY IN A CARNIVOROUS CRAR

Hawaii Univ., Honolulu. Dept. of Zoology and Water Resources Research Center. For primary bibliographic entry see Field 5B. W77-12063

THERMAL TOLERANCE AND RESISTANCE OF NORTHERN ANCHOVY, ENGRAULIS

University of Southern California, Los Angeles. G. D. Brewer

Fishery Bulletin, Vol 74, No 2, p 433-447, 1977. 10 fig, 4 tab, 45 ref.

Descriptors: *Thermal stress, *Water tempera-ture, *Heat resistance, *Growth stages, *Fish, Mortality, *Toxicity, Fish populations, Environ-mental effects, Teleosts, Resistance, Growth mental effects, Teleosts, Resistance, Growth rates, Heated water, Bioassay, Laboratory tests. Identifiers: *Thermal tolerance, *Northern anchovy, Engraulis mordax.

An experimental, flow-through seawater system, was used to determine aspects of thermal tolerance, resistance, rates of acclimation, and some effects of temperature on the development and growth of the anchovy. Thermal tolerand determined for juvenile and adult fish, acclimated to six constant temperatures between 8 and 28C. Thermal resistance (minutes until death for fish exposed to a lethal temperature) was independent of photoperiod and fish size; however, females proved more resistant than males, and resistance decreased at night. Acclimation (as measured by resistance) from 12 to 20C was nearly complete after 2-day exposure to the higher temperature; ac-climation from 20 to 12C was nearly complete after 5-day exposure to the lower temperature. Fish subjected to fluctuating water temperature between 12 and 20C proved less resistant to cold than a 12C (constant) acclimated group and less re-sistant to heat than a 20C (constant) acclimated group. Thermal tolerance was determined for larvae in the yolk-sac stage, acclimated to four constant temperatures between 12 and 24C. Although hatching occurred at temperatures as high as 29.5C and as low as 8.5C, the percentage of normally developed larvae equaled that of controls developed larvae equaled that of controls (incubated at 16C) only between temperatures of 27.0C and 11.5C. Embryos in the blastodisc stage proved most sensitive to acute temperature increases when compared to embryos in the blastopore closure stage and larvae in the yolk-sac stage. These same three stages proved insensitive to acute temperature decreases to 0.5C for 60-min exposure periods. (Katz) W77-12069

GROWTH OF SIX SPECIES OF BIVALVE MOL-LUSCS IN A WASTE RECYCLING-AQUACUL-TURE SYSTEM,

Woods Hole Oceanographic Institution, Mass. R. Mann, and J. H. Ryther. Aquaculture, Vol. 11, p. 231-245, 1977. 6 tab, 11 Descriptors: *Mollusks, *Aquiculture, *Phytoplankton, *Tertiary treatment, *Secondary treatment, *Biodegradation, *Recycling, *Commercial shellfish, *Growth rates, *Animal growth, Algae, Marine algae, Sewage treatment, Cultures, Waste water treatment, Laboratory tests, Mortality.

Growth of six species of bivalve molluscs (Crassostrea gigas, Tapes iaponica, Mercenaria mercenaria, Crassostrea virginica, Mytilus edulis, and Ostrea edulis) was compared in a waste recycling-aquaculture system. Tests were conducted at experimental temperatures of 15 20C, over the period November 1975 to May 1976. Experimental animals were fed algae grown in large outdoor cultures enriched with secondary treated sewage effluent. C. gigas, T. iaponica and O. edulis grew well. M. mercenaria, C. virginica and M. edulis exhibited poor growth. C. gigas exhibited a greater increase in total live weight at 20C but a greater increase in mean dry meat weight at 15C. Similarly, at 15C T. iaponica exhibited consistently higher increments of both live weight and dry meat weight. The economic feasibility of raising these commercially important molluscs in the waste recycling-aquaculture system was also discussed.(Katz) W77-12070

ACUTE TOXIC EFFECTS OF TWO LAMPRI-CIDES TO TWENTY-ONE FRESHWATER IN-

VERTEBRATES, Bureau of Sport Fisheries and Wildlife, Millersburg, Mich. Hammond Bay Biological Station. R. P. Rye Jr., and E. L. King Jr.
Transactions of the American Fisheries Society,

Vol. 105, No. 2, p. 322-326, 1976. 1 tab, 9 ref.

Descriptors: *Bioassay, *Toxicity, *Mortality, *Lampreys, Invertebrates, *Larvicides, Laboratory tests, Lethal limit, Pesticides, Pesticide toxicity, Resistance, Annelids, Snails. Identifiers: *LC50, *Lampricides, Freshwater invertebrates, Selective toxicity.

Laboratory static bioassays were conducted to determine acute toxicity of two lampricides-Bayer 73 and a mixture containing TFM and Bayer 73 (TFM-2B)-to 21 freshwater invertebrates. LC50 values were determined for 24-h exposure periods at 12.8 C. Organisms relatively sensitive to Bayer 73 were a turbellarian, aquatic earthworms, snails, a clam, blackflies, leeches and a daphnid. The invertebrates most sensitive to TFM-2B were turbellarians, aquatic earthworms, snails, blackflies, leeches and burrowing mayflies. Bayer 73 was nerally much more toxic to the test organisms than TFM-2B. At lampricidal concentrations, TFM-2B was more highly selective than Bayer 73 against larval sea lampreys. (Katz) W77-12071

OBSERVATIONS ON THE FISH FAUNA AS-SOCIATED WITH OFFSHORE PLATFORMS IN THE NORTHEASTERN GULF OF MEXICO, College of South Jersey, Camden. Dept. of Biolo-

gy. For primary bibliographic entry see Field 2L. W77-12072

THE TOXICITY OF ZINC TO THE IMMUNE RESPONSE OF THE ZEBRAFISH, BRACHYDANIO RERIO, INJECTED WITH VIRAL AND BACTERIAL ANTIGENS, New York Univ., N.Y. Lab. of Aquatic Siology. D.A. Sarot, and A. Perlmutter. Transactions of the American Fisheries Society, Vol. 105, No. 3, p. 456-459, 1976. 2 tab., 16 ref.

Descriptors: *Laboratory tests, *Viruses, *Bacteria, *Zinc, *Toxicity, *Infection, *Fish physiology, *Fish toxins, Microbiology, Analytical techniques, Fish, Metals.

Identifiers: *Plasma neutralization test, Proteus, *Antigens, *Antibodies, *Immune response, Immune system, Immunosuppressors, *Infectious pancreatic necrosis virus(IPNV), *Zebrafish,

Groups of zebrafish, Brachvdanio rerio, were injected with antigens prepared from infectious pan-creatic necrosis virus (IPNV) or Proteus vulgaris. Zinc appeared to suppress the immune response against Proteus vulgaris, but not against IPNV. (Katz) W77-12073

MODIFICATION OF RIVER BEDS AND OF THE COURSES OF RIVERS IN UPPER BELGI-

For primary bibliographic entry see Field 6C. W77-12183

FOR HOLDING AQUATIC MICROINVERTEBRATES DURING TOXICITY TESTS IN A FLOW-THROUGH DILUTER SYSTEM.

Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5A.

W77-12185

INFLUENCE OF VARIOUS CONCENTRATIONS OF ORTHOPHOSPHATE ON THE DIVISION RATE OF AN ESTUARINE BENTHIC DIATOM, NAVICULA ARENARIA, IN CULTURE, Groningen Rijksuniversiteit (Netherlands). Dept.

of Systematic Biology.

W. Admiraal.

Marine Biology, Vol 42, p. 1-8, 1977; 2 fig, 3 tab,

Descriptors: *Diatoms, *Benthic flora, *Cytological studies, *Chlorophyll, *Phosphates, Descriptors: Organic compounds, Biology, Chromosomes, Reproduction, Genetics, Aquatic algae, Phytoplankton, Estuaries, Nutrients, Nutrient requirements, Growth rates, Plankton, *Diatoms. Identifiers: Cell division, Division rates, *Orthophosphates.

The estuarine benthic diatom Navicula arenaria Donkin was grown in perfusion chambers in which the cells adhered to analytical sand. A synthetic medium, containing various concentrations of orthophosphate, was continuously pumped through the cultures to prevent exhaustion of the medium. The division rates of the diatoms were independent of phosphate concentration in the medium from about 0.3 to 8 ug-at/1; lower concentrations were limiting (Ks about 0.1 ug-at/1). The phosphate and chlorophyll a content of the N. arenaria cells was independent of phosphate con-centration (even under limitation), except that the phosphate content of cells grown in media with 8 ug-at of phosphate increased. The data indicate that this benthic diatom uses low phosphate concentrations for growth as efficiently as several planktonic diatoms. The phosphate concentrations previously observed in the Eems-Dollard estuary (the original habitat of our strain of N. arenaria) were clearly higher than those limiting the growth rate of the cultures, and consequently may have no influence on benthic diatom growth. (Katz) W77-12186

EFFECTS OF SALINITY ON THE EGGS AND FRY OF THE GOLDEN SHINER AND GOLD-

Georgia Agricultural Experiment Station, Savannah; and Skidaway Inst. of Oceanography, Savannah, Ga. T. Murai, and J. W. Andrews.

The Progressive Fish-Culturist, Vol 39, No 3, p 121-122, 1977. 1 tab, 10 ref.

Descriptors: *Salinity, Resistance, Saline water, *Toxicity, *Lethal limit, *Fish eggs, *Fry, *Shiners, Freshwater fish, Environmental effects, Water quality, Minnows, Juvenile fish. Identifiers: *Golden shiner, *Goldfish.

The salinity tolerance of the eggs and fry of the golden shiner (Notemigonus crysoleucas) and oldfish (Carassius auratus) was tested. Salinities of 0, 2, 4, 6 and 8% were used. Eggs of both species were only slightly affected, but immediately after hatching a marked reduction in salinity tolerance was observed. Total mortality of fry of both species occurred at 8% salinity. The survival rates of both species decreased with increased salinity, but the survival of the shiner fry decreased a fish. (Katz) ed at a greater rate than that of the gold-

TOXICITY BIOASSAYS WITH PERIPHYTON COMMUNITIES: DESIGN OF EXPERIMENTAL

Minnesota Univ.-Duluth. Dept. of Biology. For primary bibliographic entry see Field 5A.

BEHAVIOR OF JUVENILE CHINOOK SAL-MON (ONCORHYNCHUS TSHAWYTSCHA) IN RELATION TO SIMULATED THERMAL EF-

Battelle Pacific Northwest Lab., Richland, Wash., Ecosystems Dept.

R. H. Gray, R. G. Genoway, and S. A.

Barraclough. Transactions of the American Fisheries Society, Vol. 106(4), p. 366-370, 1977. 1 tab, 1 fig, 10 ref.

Descriptors: *Salmon, *Chinook, Juvenile fish, *Fish behavior, Laboratory tests, *Thermal water, Fresh-water fish, Water pollution effects, *Thermal stress, *Thermal pollution, Coldwater fish, Methodology, *Bioassay, Laboratory equip-

Identifiers: *Simulated thermal effluent, *Juvenile Chinook salmon, Thermal plume, River-plume in-

Instantaneous responses of juvenile salmonids that encounter a simulated river-thermal plume interface were assessed in a model raceway with a thermal discharge. Fish movement and response to the discharge were recorded on videot venile chinook salmon (Oncorhynchus tshawytscha) tested under three discharge conditions (no plume, ambient plume, and heated plume) avoided heated plumes when plume delta T's were greater than 9-11C above ambient. Fish occasionally oriented to the discharge current, but were not attracted to the thermal component of the plume when plume delta Y's were below the avoidance level of 11C. Fish did not pass to the lower end of the raceway when plume delta T exceeded 9-11C. (Katz) W77-12190

HYPOLIMNION OXYGENATION AND ITS EF-FECTS ON THE DEPTH DISTRIBUTION OF RAINBOW TROUT (SALMO GAIRDNERI) AND GIZZARD SHAD (DOROSOMA CEPEDIANUM), Ohio Cooperative Fishery Research Unit, Colum-

W. J. Overholtz, A. W. Fast, R. A. Tubb, and R.

Transactions of the American Fisheries Society, Vol. 106(4), p. 371-375, 1977. 4 fig, 15 ref.

Descriptors: Ohio, *Rainbow trout, Gill nets, *Hypolimnion, *Epilimnion, Limnology, *Oxygen, Water quality, Water temperature, Fish management, Recreation, *Ponds, Reaeration, Oxygenation, Fresh water, Fish harvest, Fish Identifiers: *Gizzard shad, Quarry pond, Hypolimnion oxygenation.

The hypolimnion of a quarry pond at Ottoville, Ohio, was artificially oxygenated by using a sidestream pump. Summer concentrations of dissolved oxygen were increased from almost 0 to 8 mg/liter in 1973 and were held at or above 7 mg/liter (range 7.0-21.5) in 1974: thermal stratification was maintained in both years. In previous years, when the pond was not artificially oxygenated or aerated by other means, rainbow trout (Salmo gairdneri) did not survive the summer. One thousand rainbow trout were stocked after oxygenation in August 1973 and 800 stocked in May 1974. Anglers creeled several hundred fish each summer and gill net catch per effort remained constant during the study periods indicating that survival was probably high. Gill netting in February 1974 confirmed that trout were still present from the previ-ous summer stocking. Trout were largely confined to the hypolimnion during thermal stratification, and were usually near its upper boundary. The fish apparently suffered no ill effects from the oxygen concentrations of 21 mg/liter in 1974. Gizzard shad (Dorosoma cepedianum) remained in the epolimnion during both summers. (Katz) W77-12191

SPAWNING SUCCESS OF THE BLACK CRAP-PIE, POMOXIS NIGROMACULATUS, AT REDUCED DISSOLVED OXYGEN CONCEN-

Environmental Research Lab.-Duluth, Minn. R. E. Siefert, and L. J. Herman. Transactions of the American Fisheries Society, Vol. 106(4), p. 376-379, 1977. 1 tab, 8 ref.

*Freshwater *Dissolved oxygen, *Bioassays, Laboratory tests, Fish physiology, Fish reproduction, Fish farming Methodology, Fish eggs, Water pollution effects, Aquiculture, Water quality, Sea water, *Spawning.
Identifiers: *Black crappie.

Mature black crappies (Pomoxis nigromaculatus) were exposed to constant oxygen (DO) concentra-tions near or at 2.5, 3.5, 5.0, or 6.5 mg/liter, and near air saturation (control) to determine the effects of reduced DO on spawning success. The fish spawned successfully 39 times in laboratory tanks under a simulated natural temperature and high regime at all DO concentrations tested. Fish at 2.5 mg/liter DO started and finished spawning at earlier dates than those at the higher oxygen concentrations; fish at saturation started and finished spawning at later dates than those at reduced concentrations. The number of embryos from a single spawning ranged from 14,600 to 155,300. Number of spsawnings, viability of embryos, hatching success, and survival through swimup were similar between control fish and those exposed to reduced oxygen concentrations. (Katz) W77-12192

INFLUENCE OF ACCLIMATION TEMPERATURE ON PREFERRED TEMPERATURE IN THE RAINBOW TROUT SALMO GAIRDNERI, Wilfrid Laurier Univ., Waterloo (Ontario). Dept

R. W. McCauley, J. R. Elliott, and L. A. A. Read. Transactions of the American Fisheries Society. Vol. 106(4), p. 362-365, 1977. 1 tab, 16 ref.

Descriptors: *Fish physiology, *Fish behavior, *Rainbow trout, Freshwater fish, Water pollution effects, *Water temperature, *Thermal sollution, Thermal power plants, effects, "Water temperature, "Thermal stress,
"Thermal pollution, Thermal power plants,
Laboratory tests, Methodology, Bioassay,
Laboratory equipment.
Identifiers: Acclimation, Acclimation temperature, "Preferred temperature(Trout), Body temperature, Environmental temperature.

The relation of preferred temperature to acclimation temperature of 29 rainbow trout 15 months old was examined during summer. Fish were accli-mated to 5, 10, 15, 20 and 25C, respectively, and

Group 5C-Effects Of Pollution

tested individually in an electrically controlled shuttle-box device. Body temperatures monitored by a radiothermometer ingested by the fish closely approximated occupied temperatures to within 0.2C. No significant differences were found in preferred temperature over the acclimation range studied. The calculated final preferendum was 11.3C. Fish regulated environmental and body temperature with the same precision as they selected temperature in a spatial gradient. (Katz)

SUPPRESSION OF THE PRIMARY IMMUNE RESPONSE IN RAINBOW TROUT, SALMO GAIRDNERI, SUBLETHALLY EXPOSED TO TRITIATED WATER DURING EMBRYOGENE-

Battelle Pacific Northwest Labs. Richland, Wash. Ecosystems Dept.

J. J. Strand, M. F. Fujihara, R. D. Burdett, and T. M. Poston.

Journal of the Fisheries Research Board of Canada, Vol. 34, p. 1293-1304, 1977. 4 fig, 6 tab, 22

Descriptors: *Salmonids, *Rainbow trout, *Trout, *Embryonic growth stage, *Fish diseases, *Fish parasites, *Irradiation, *Radiochemical analysis, *Tritium, Proteins, Biochemistry, Biology, Laboratory tests, Analytical techniques, Water quality. Toxicity. Environmental effects,

Laboratory
quality, Toxicity, Environmental
Genetics, Bioassay.
Identifiers: *Flexibacter columnaris, Bioaccumulation, Antibody synthesis, Immunology, Agglutination assay, Primary immune response,

Antibody synthesis, in response to vaccination with a 0.1-ml (1.8 x 10 to the 8th power cells/ml) intraperitoneally injected, heat-killed strain of Flexibacter columnaris, was employed to investigate the effect of tritium irradiation (0, 0.04, 0.4, 4.0, 40 rads total dose for 20 days during embryogenesis) on development of the primary immune response in 5-mo rainbow trout, Salmo gairdneri, reared under essentially pathogen-free conditions. Specific agglutinins to F. columnaris, determined 1-wk prevaccination, and 3, 5, 7, 9, and 11 wk postvaccination increased rapidly in both control and irradiated fish following vaccination. Agglu-tinin levels in irradiated fish were suppressed to 50% of control levels at 40 rads during the 9th wk, and 50% of control levels at 4.0 rads during the 11th wk. electrophoretic separation of serum proteins of both control and irradiated-vaccinated fish demonstrated four major protein fractions. Densitometric analyes demonstrated that fraction IV increased significantly in percent of total protein following antigenic stimulation, suggesting that fraction IV represents the specific humoral antibody to F. columnaris. The relative percent of total protein contained in fraction IV was signifireduced in irradiated-vaccinated fish. (Katz) W77-12194

THERMOPREFERENCE BEHAVIOR OF BLUEGILL (LEPOMIS MACROCHIRUS) SUB-JECTED TO RESTRICTIONS IN AVAILABLE TEMPERATURE RANGE,

Wisconsin Univ., Madison. Lab. of Limnology. T. L. Beitinger.

Copeia, No 3, p 536-541, 1977. 2 tab, 27 ref.

Descriptors: *Juvenile fish, *Water temperature, *Fish behavior, *Fish physiology, *Temperature, *Teleosts, Freshwater fish, Thermal stress, En-vironmental effects, Thermal properties, Water quality, Water properties, Laboratory tests, Warm water fish, *Sunfishes.
Identifiers: *Thermopreference(Fish).

Juvenile bluegill (Lepomis macrochirus) acclimated to 25C occupied a temperature range of 29.5 to 33.1C in laboratory preference studies. The mid-point of this range, 31.2C, is considered an estimate of the final temperature preferendum for this species. Experiments were designed to determine (1) the behavioral response of bluegill to situations where available temperatures were either (a) greater or (b) less than their preferendum; and (2) whether a constant temperature approximately either 1C above or below the limis of the occupied range would influence thermoselection behavior by bluegill. When the temperature preferendum as unavailable, bluegill spent more than 92% of their time at the temperature nearest the preferendum. The availability of constant nonpreferred temperatures appeared to have little influence on thermoselection behavior; median precent time spent at the two non-preferred temperatures, 28.0 and 34.0C, were 9.1% and 1.3%, respectively. In addition, a separate experiment demonstrated that of the two limits of the preferred range, the lower limit is most labile. These findings are related to the thermal ecology of the bluegill. (Katz) W77-12195

VERTICAL GRADIENTS IN ARTIFICIAL SUB-STRATE-ASSOCIATED PROTOZOAN COMMU-NITY STRUCTURE IN A STRATIFIED FRESH-WATER LAKE, Vanderbilt Univ., Nashville, Tenn. Dept. of Biolo-

R. C. Jones, J. Cairns, Jr., and W. H. Yongue, Jr. The Journal of the Elisha Mitchell Scientific Society, Vol 92, No 1, p 1-8, 1976. 2 fig, 7 tab, 5

*Protozoa, *Speciation. Descriptors: *Gradients(Stream), *Stratification, *Epilimnion, *Hypolimnion, Invertebrates, Aquatic life, Methodology, Laboratory tests, Populations, Growth rates, Productivity, Gradation, Profiles, Lakes, Density stratification.

Identifiers: *Vertical gradients, Artificial sub-

strates.

Vertical gradients in substrate-associated protozoan community structure in a stratified freshwater lake were investigated using polyurethane foam substrates. Samples were collected at depths of 0.2 m, 6 m, 10 m, 15 m, and 20 m at 9 days, 16 days, 23 days, 30 days, and 37 days after substrate placement in the lake. Protozoan species lists were made for each sample using standard keys. Physical chemical data were collected concurrently. On the basis of numbers of species and kinds of species two similar groups were evident: epilimnion (0.2 m, 6 m, 10 m) and hypolimnion (15 m and 20 m). Although initial rates of species number increase through colonization were similar at all depths, colonization continued much longer in the epilimnion, resulting in a significantly greater number of species on epilimnion substrates at MacArthur-Wilson equilibrium. Per cent over-lap of kinds of 'residents' species was high within a substrate group and low between groups. (Katz) W77-12196

DETERMINATION OF ORGANOCHLORINE PESTICIDES IN THE TISSUE OF THE BLACK MULLET (MUGIL CEPHALUS) AND THE SILVER MULLET (MUGIL CUREMA), Miami Univ., Coral Gables, Fla. Research and Teaching Center of Toxicology. For primary bibliographic entry see Field 5B. W77-12197

THE EFFECTS OF WASTEWATER APPLICA-TION ON THE GROWTH AND CHEMICAL COMPOSITION OF FORAGES, Cold Regions Research and Engineering Lab.

Hanover, N.H.

For primary bibliographic entry see Field 5E. W77-12198

THE EFFECTS OF DDT, DDE AND THEIR SUL-FONATED DERIVATIVES ON EGGSHELL FORMATION IN THE MALLARD DUCK, Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab.

Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 697-701, 1977. 2 fig, 9

Descriptors: *Ducks(Wild), *Mallard duck, *Chlorinated hydrocarbon pesticides, *DDR, *DDT, Organic compounds, *Toxicity, *Sulfonates, Path of pollutants, Environmental ef-"Suffonates, Path of pollutants, Environmental efects, Halogenated pesticides, Size, Reproduction, Animal physiology, Bioassay.
Identifiers: "Annas platyrhynchos, Eggshell formation, "Duck eggs, Bioaccumulation, Tissue analysis, Sulfonated derivatives.

While DDT and DDE fed to mallard ducks (Anas platyrhynchos) at levels of 10 ppm and 50 ppm caused significant alterations in eggshell measurements, such as thickness, weight, and in R-values, their sulfonated derivatives did not show these characteristics. While the sulfonated compounds caused a reduction of thickness, it was not as severe as that caused by DDT or DDE and was a transitory effect. The sulfonated products of DDT and DDE were show to be less toxic to birds during egg production than the parent compounds. W77-12200

COMPARATIVE SENSITIVITY OF EGGS, LAR-VAE, AND ADULTS OF THE ESTUARINE TELEOSTS, FUNDULUS HETEROCLITUS AND

MENIDIA MENIDIA TO CADMIUM, Environmental Research Lab., Gulf Breeze, Fla.; and Environmental Research Lab., Johns Island,

S.C. Bears Bluff Field Station.
D. P. Middaugh, and J. M. Dean.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 645-652, 1977. 4 tab,

Descriptors: *Toxicity, *Metals, *Cadmium, Estuaries, *Salinity, Life history studies, Fish, Larvae, Growth stages, Fish eggs, Mature growth stage, Environmental effects, Resistance, Juvenile fish, Teleosts. Identifiers: *Fundulus heteroclitus, *Menidia

menidia, Mummichog, Atlantic Silverside.

Cadmium sensitivity of the mummichogs, Fundulus heteroclitus, and the Atlantic Silverside, Menidia menidia, were measured at specific stages of their life histories. Results indicated little cador their life histories. Results indicated fittle cap-mium sensitivity with developing eggs of both spe-cies. Larvae of both species showed more sen-sitivity to cadmium toxicity than the eggs or adults. Adult Fundulus showed more sensitivity at higher salinity regimes, while Menidia indicated only slight differences in response at varied salini-W77-12201

INTERACTIVE EFFECT OF CHROMIUM COM-POUNDS AND A FUNGAL PARASITE ON CARP

EGGS, Oak Ridge National Lab., Tenn.

Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 693-699, 1977. 2 fig, 1 tab, 9 ref.

Descriptors: *Fish eggs, *Carp, *Toxicity, *Chromium, *Fish diseases, *Pathogenic fungi, *Fish parasites, *Fungi, Freshwater fish, Metals, Mortality, Growth rates, Environmental effects, Animal pathology, Fish management, Inhibition. Identifiers: *Saprolegniales, Hatchability, Hexavalent chromium, Trivalent chromium.

A fungal parasite (Saprolegniales) of carp eggs was exposed to hexavalent and trivalent chromium

compounds at concentrations identical to those used in a study of the effects of the same com-pounds on carp egg hatchability. Comparison of data from both experiments revealed that increased egg mortality and increased fungal growth were coupled at low concentrations of the compounds. A mechanism for the interaction of a chemical stress and a biological stress on carp egg survival in natural systems is presented. (Katz) W77-12202

DOES LOW ENVIRONMENTAL PH IN-FLUENCE HEPATIC GROWTH IN FISH, Oslo Univ. (Norway). Inst. of Zoology. O. J. Jacobsen.

Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 667-669, 1977. 1 tab, 7

Descriptors: Fish physiology, *Salmonids, *Trout, *Brown trout, *Hydrogen ion concentration, Water quality, Water properties, Environmental effects, Growth rates, Water chemistry, Laboratory tests, Bioassay.

Identifiers: Fish lives, *Hepatic growth, Tissue analysis, Environmental pH.

The effects of chronically reduced pH on brown trout (Salmo trutta) liver were investigated. Results indicated slower hepatic growth in fish held at lower pH. Suggestions for further study were discussed. (Katz)

THE TOXICITY OF ENDRIN AND THE EF-FECT OF PRETREATMENT OF PHENOBAR-BITAL AND HEXOBARBITAL ON MORTALI-TY IN FOUR FRESH WATER FISHES,

Marathwada Univ., Aurangabad (India). Dept. of

Matanara Zoology. M. S. Kachole, S. S. Pawar, and A. G. Mahajan. Bulletin of Environmental Contamination and Toxicology, Vol 17, No 6, p 768-770, 1977. 2 tab, 3

Descriptors: Freshwater fish, *Inhibitors, *Toxicity, *Organic compounds, *Mortality, *Endrin, Resistance, Chlorinated hydrocarbon pesticides, Halogenated pesticides, Metabolism, Path of pollutants, Biochemistry, Enzymes, Fish physiology, Mode of action. Identifiers: *Phenobarbital, *Hexobarbital, Liver.

Results suggested a protective effect of 2 classic inducers of hepatic drug metabolism, phenobarbital and hexobarbital, on the endrin toxicity in 4 species of freshwater fish. The observed differences in the magnitude of protection was at-tributed to species variation. Phenobarbital and hexobarbital in the liver caused induction of nexoparottal in the liver caused induction of hepatic mixed function oxidase system. It was sug-gested that pretreatment of the 2 compounds in fishes could develop some capacity to tolerate en-drin in the CNS level. (Katz) W77-12204

OF RESIDUES OF POLYCHLORINATED BIPHENYL AROCLOR 1254 ON THE SENSITIVITY OF RAINBOW TROUT TO SELECTED ENVIRONMENTAL

CONTAMINANTS, Fish and Wildlife Service, La Crosse, Wis. Fish Control Lab.; and Fish and Wild Life Service, La Conste Wis. Fish Pesticide Research Unit.
T. D. Bills, L. L. Marking, and L. E. Olsen.
The Progressive Fish-Culturist, Vol 39, No 3, p

150, 1977. 5 ref.

Descriptors: *Toxicity, *Salmonids, *Aroclors, *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Metals, *Rainbow trout, Nitrates, Nitrites, *Chromium, Lethal limit, Metabolism.

ts.

Identifiers: Bioaccumulation, Aroclor 1254,

The effects of the PCB Aroclor 1254 residues on the toxicity of six environmental contaminants (cyanide, chromium, nitrate nitrogen, nitrite nitrogen, chlorine and mercury) to rainbow trout (Salmo gairdneri) were tested. The toxicity of cyanide was increased by high and low concentrations of the PCB; the toxicity of chromium was increased only by the high concentration. The toxicities of the other 4 compounds were unaffected by either Aroclor concentration. (Katz) W77-12205

SOME FACTORS EFFECTING ALGAL DENSI-TIES IN A EUTROPHIC FARMLAND STREAM, Bath Univ. (England). School of Biological

J. W. Moore Oecologia, Vol 29, p 257-267, 1977. 5 fig, 2 tab, 26

Descriptors: *Algae, Environmental effects, Populations, Productivity, *Growth rates, *Eutrophication, *Primary productivity, *Sessile algae, *Protozoa, Physicochemical properties, Hydrogen ion concentration, Streamflow, Water temperature, Light intensity, Water quality, Water properties, Streams, Nitrogen compounds, Sampling, Phosphorous compounds, Silicates, Inoranic compounds.

Identifiers: Farmland streams, *Epipelon, *Epilithon, *Cladophora glomerata, Fromtonia

Population dynamics of attached algae in a eutrophic farmland stream were correlated through multiple regression analyses with changes in 7 physico-chemical parameters (temperature, light, water velocity, pH, NO3-N, P205-P, SiO2-Si) Samples were taken austra unach for Singles. Si). Samples were taken every 2 weeks for 25 consecutive months between June 1973 and June 1975. The relative significance of the 7 parameters in controlling densities varied widely depending on species. Overall light was most important, accounting for 28 and 17% of density changes in the epipelon and epilithon respectively. While winter flooding caused a sharp reduction in the density of these 2 communities, the concentration of P2O5-P and NO3-N and pH usually had little effect on and NOS-N and pri usually has after effect of numbers. The 7 parameters did not exert major control over the epiphyton, normally accounting for less than 30% of densities variation. Grazing by the protozoa Frontonia acuminata may have sig-nificantly reduced the density of epipelon for 2 months during the spring but otherwise was of no importance to any community. (Katz) 77-12209

THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF LARVAL FISHES: A LABORATORY ASSESSMENT, State Univ. of New York at Stony Brook. Marine Sciences Research Center.

J. R. Schubel, C. F. Smith, and T. S. Y. Koo. Chesapeake Science, Vol 18, No 3, p 290-298, 1977. 2 fig, 5 tab, 24 ref.

Descriptors: *Larvae, *Larval growth stage, *Toxicity, *Heated water, *Thermal water, *powerplants, Heat resistance, *Water temperature, *Herrings, *Striped bass, *Thermal stress, Water pollution sources, Sea basses, Mortality, Powiese Mortality, Provided Page 1989. Environmental effects, Laboratory tests. Identifiers: *Shad, *American shad, *Blueback

Blueback herring (Alosa aestivalis), American shad (Alosa sapidissima), and striped bass (Morone saxatilis) larvae from the Chesapeake Bay region were subjected in the laboratory to time-excess temperature histories typical of those experienced by organisms entrained by power plants with a variety of design and operating criteria. The maximum excess temperature ranged from 7 to 20 degrees above the base temperature (the average surface water temperature on the spawning grounds); the time of exposure to a maximum excess temperature from 4 to 60 minutes; and the period of cooling to the final temperature from 60 to 300 minutes. An excess temperature of 20 degrees resulted in virtually total mortality of larvae of all three species. Striped bass larvae were the most tolerant of the three species and could withstand excess temperatures of up to 10 degrees with no significant increase in mortality. The response patterns of the other two species were more complicated. (Katz)

THE EFFECT OF PH ON THE POPULATION GROWTH OF THREE SPECIES OF DUCKWEED: SPIRODELA OLIGORRHIZA, LEMNA MINOR AND WOLLFIA ARRHIZA, Canterbury Univ., Christchurch (New Zealand).

Dept. of Zoology. C. L. McLay.

Freshwater Biology, Vol 6, No 2, p 125-136, 1976. 9 fig. 4 tab, 10 ref.

Descriptors: *Growth rates, Population, *Hydrogen ion concentration, *Biomass, *Aquatic plants, *Mathematical studies, Water quality, Environmental effects, Water properties, Laboratory tests. Algae. Fresh water. Identifiers: *Duckweed.

Growth was most successful in media with regucrown was most successful in media with regulated pH where sustained logarithmic population increases were achieved. S. ofigorhiza and L. minor rates were symmetrical about an almost neutral, optimal pH, declining rapidly away from the optimum. W. arrhiza had an optimum at pH 5 and ground declined with increasing at 12 4 2 2 2 and growth declined with increasing pH. All 3 species had optima at, or below, the neutral point. Estimated lower limits, optimum and upper limits for each species were: W. arrhiza, pH 4-5.0-10, L. minor, pH 4-6.2-10, S. oligorrhiza, pH 3-7.0-10. Growth rate along a pH gradient was best described by polynomial equations. Rates of population growth were similar for all species. In decreasing order they were: Wolffia, Lemna, Spirodela. However, in biomass units Lemna grew more than 6 and Spirodela 17 times faster than Wolffia. (Katz) W77-12211

VERGLEICHENDE PRUFUNGEN FISCHTOXIZITATEN AN ELRITZEN FOREL-LEN UND GOLDORFEN (COMPARATIVE TESTS ON TOXICITY TO FISH USING MIN-NOWS, TROUT, AND GOLDEN ORFE), (IN GERMAN),

Farbenfabriken Bayer A.G., Leverkusen (West

For primary bibliographic entry see Field 5A. W77-12212

POLYCHLORINATED BIPHENYI. POUNDS (PCB'S) AND FISHERY RESOURCES, Fish and Wildlife Service, Washington, D.C. Office of Biological Services.

Fisheries, Vol 1, No 4, p 19-25, 1976. 4 fig, 19 ref.

Descriptors: *Toxicity, *Polychlorinated biphenyls, "Path of pollutants, "Ecosystems, "Toxins, Food chain, Freshwater fish, Aquatic life, Mode of action, Environmental effects, Population, Growth rates, Behavior, Aroclors, Water pollution effects.

Identifiers: Bioaccumulation

PCB's were concluded to be highly persistant environmental contaminants that bioaccumulate in food chains and produce direct and chronic affects, as well as have a subtle effect on growth, reproduction, behavior, and health of fish, birds, and mammals. Freshwater fish were found to be particularly susceptible to chronic effects because PCB residues were concentrated by fish at high levels known to elicit serious toxicological effects. levels known to elicit serious toxicological effects. Fish-eating birds and mammals were also found to

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have hazardous concentrations of residues. However, the actual mode of action and ecological effects were considered poorly understood, as was the long-term impact of PCB's on animal populations. (Klein) W77-12213

ACCUMULATION AND ELIMINATION OF ALPHA-HEXACHLOROCYCLOHEXANE (ALPHA-HCH) BY THE MARINE ALGAE CHXLAMYDOMONAS AND DUNALIELLA, Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands). Lab. for Toxicology. J. H. Canton, G. J. Van Esch, P. A. Greve, and A. B. A. M. Van Hellemond.
Water Research, Vol 11, p 11-115, 1977. 5 fig, 5 tab, 3 ref.

Descriptors: *Organic compounds, *Algae, *Absorption, *Chlamydomonas, *Chlorophyta, Path of pollutants, Mode of action, Plant physiology, Cytological studies, Analytical techniques, Metabolism.

Identifiers: *Alpha-hexachlorocyclohexane, HCH, Bioaccumulation, Tissue analysis, Dunaliella.

Chlamydomenas rapidly accumulated HCH from aqueous solutions; elimination occurred within 30 min. HCH was not found to be acutely toxic to Chlamydomonas in concentrations up to the solubility limit. The accumulated HCH was found primarily in the cell content, corresponding with the low fat content of the cell wall: the non-lipid fraction accumulated 11-14% of the total amount of HCH only. Accumulation of HCH proved to be correlated with the lipid content of the cell, as illustrated by accumulation experiments with algae with different fat content. The concentration factor on lipid basis was 12000-13000. No difference was found in accumulation behavior between living or dead algae cell. (Klein)

MODEL KUMULACJI 137CS U KARPIA (CYPRINUS CARPIO L.) A MODEL OF THE CUMULATION OF 137CS IN THE CARP CYPRINUS CARPIO L.), (IN POLISH), Instytut Ksztaltowania Srodowiska, Katowice

J. Kwapulinski, A. Buszman, and G. Kwapulinska. Acta Hydrobiologica, Vol 18, No 2, p 183-192, 1976. 4 tab. 20 ref.

(Poland)

Descriptors: *Metals, *Carp, *Cesium, *Growth stages, Freshwater fish, Metabolism, Fallout, Path of pollutants, Alkali metals, Mathematical studies, Water quality, Growth rates, Sediments, Radioactivity.

Identifiers: Bioaccumulation, Tissue analysis.

In the work a model of 137Cs cumulation in the stages of development of the carp was presented. The model included the influence of body weight and weight increase on the concentration of 137Cs in them. Moreover, an equation was given illustrating the influence of the activity of bottom sediments and global fall-out. The model was checked using the results of 137Cs determinations in the years 1965-1970. (Klein) W77-12215

BENTHIC MACROFAUNAL DYNAMICS, PRODUCTION, AND DISPERSION IN AN OXYGEN-DEFICIENT ESTUARY OF WEST SWEDEN, Swedish Water and Air Pollution Research Lab.

Gothenberg.

R. Rosenberg.

Journal of Experimental Marine Biology and Ecology, Vol 26, p 107-133, 1977. 14 fig, 3 tab, 53 ref.

Descriptors: *Salinity, *Estuaries, *Oxygen, Population, *Biomass, *Speciation, Diversity,

Dispersion, Eutrophication, Productivity, Oxygen requirements, Benthic fauna, Aquatic life, Water quality.

Identifiers: *Anoxic water, Fjord, Halocline,

The salinity above the halocline (13-15 m) in the Bytjord estuary was 23-30%. Below the halocline the oxygen concentration diminished abruptly and below 15-20 m the water was anoxic. The benthic macrofaunal communities were studied during 1971-1973 from 5 m down to the anoxic and afaunal bottoms. Number of species, abundance, and biomass were estimated in different strata in the sediments (0-5, 5-10 cm) and the seasonal variation was studied. The benthic faunal structure at different oldlities was compared by means of a percentage similarity index and a number of diversity indices. Dispersion was assessed by the variance/mean ratio for different block sizes and the production over one year was estimated. (Klein) W77-12216

EFFECTS OF VARIOUS CLASSES OF HERBI-CIDES ON FOUR SPECIES OF ALGAE,

Langston Univ., Okla. K. Hawxby, B. Tubea, J. Ownby, and E. Basler. Pesticide Biochemistry and Physiology, Vol 7, p 203-208, 1977. 5 tab, 16 ref.

Descriptors: *Herbicides, *Toxicity, *Mortality, *Algae, *Productivity, *Growth rates, *Organic compounds, Inhibition, Photosynthesis, Metabolism, 2,4-D, Chlorinated hydrocarbon pesticides, Cyanophyta, Chlorophyta, Environmental effects, Chlorella, Anabaena.

Identifiers: Terbuthylazine, Dinoseb, Profluralin, Prometryne, Alachlor.

Chlorella pyrenoidosa, Chlorococcum sp., Lyngbya sp., and Anabaena variabilis were cultured in Bold's basal medium. They were treated with 0.1, 1.0, and 10 microM concentrations of alachlor, terbuthylazine, dinoseb, profluralin, prometryne, and 2,4-D. Growth of all algal species tested was markedly reduced by the triazines. Alachlor, dinoseb, and fluometuron inhibited growth of some algae at higher concentrations while 2,4-D and profluralin did not inhibit growth at the concentrations tested. Photosynthesis was greatly inhibited by the triazines, even at the 0.1 microM concentration. Fluometuron was very toxic to the blue-green algae but had less effect on the green algae tested. Lyngbya was most susceptible to photosynthesis reduction by the herbicides. The concentrations of herbicides tested had little effect on respiration of the algae species. It appeared that effects on algal growth were due primarily to inhibition of photosynthesis rather than to other metabolic processes. (Klein)

EFFECTS OF WATER-SOLUBLE COM-PONENTS OF PETROLEUM OILS AND ARO-MATIC HYDROCARBONS ON BARNACLE LARVAE,

Texas Univ. at Austin, Port Aransas. Marine Science Inst.

W. H. Donahue, R. T. Wang, M. Welch, and J. A. Nicol. Environmental Pollution, Vol 13, p 187-202, 1977.

7 fig, 4 tab, 17 ref.

Descriptors: *Organic compounds, Oil, Aquatic

Descriptors: *Organic compounds, Oil, Aquatic life, *Toxicity, *Invertebrates, *Larvae, *Fuels, *Oil pollution, *Aromatic compounds, Mortality, Animal physiology, Animal behavior, Chemistry, Environmental effects, *Oil wastes, Embryonic growth stage, Metabolism, Analytical techniques. Identifiers: Water soluble fractions(Oil), *Barnacles, Tissue analysis, Crankcase oil, Diesel

*Barnacles, Tissue analysis, Crankcase oil, Diesel oil, Crude oil.

The effects of water-soluble fractions (WSF) of petroleum oils and of solutions of aromatics on embryos and nauplii of barnacles (Chthamalus fragilis and Balanus amphitrite niveus) were investigated. The oils tested were S. Louisiana, Alaska, Kuwait, Venezuela crudes, Diesel fuel, Bunker C, No. 2 fuel and crankcase oils. Eighteen aromatic hydrocarbons occurring in petroleum oils were also tested. Observations were made on development and hatching of embryos, and the activity, phototaxis and survival of larvae. Acute experiments (1 h duration) were carried out in glass tubes illuminated above, and larvae remaining on the bottom were separated from those actively swimming. Concentrations at which half the larvae occurred in the bottom fraction were determined. Oils were toxic in the series used: crankcase > No. 2 fuel oil, > Bunker C > Diesel > Venezuela > Kuwait > Alaska > S. Louisiana (in terms of percentages of WSF). Relative toxicities of the aromatics (in terms of percentages of saturated solutions) are given. Embryonic development and larval activity were adversely affected by No. 2 fuel oil at a concentration of 3 ppm and larval activity by naphthalene at the same level. (Katz) W77-12218

IMPACT OF AN URBAN METHOXYCHLOR SPRAYING PROGRAM ON THE ROUGE RIVER, MICHIGAN, Purdue Univ. Lafavette. Ind. Dept. of

Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics. For primary bibliographic entry see Field 5B.

ACUTE TOXICITY OF LIGNOSULPHONATES ON RAINBOW TROUT (SALMO GAIRDNERD), National Veterinary Inst., Oslo (Norway). Fish Disease Lab.

S. O. Roald.
Bulletin of Environmental Contamination and
Toxicology, Vol. 17, No. 6, p. 702-706, 1977. 1 fig,
1 tab, 12 ref.

Descriptors: *Mortality, Fish physiology, *Fish behavior, *Toxicity, *Salmonids, *Rainbow trout, *Sulphonates, *Sulfite liquors, *Pulp wastes, Lethal limit, Industrial wastes, Water quality, Trout, Effluents, Sulfur compounds, Organic compounds, Bioassay. Identifiers: *Lignosulphonates, Bioaccumulation, Spent sulfite liquor.

The 48-hr LC50 value for lignosulphonates for rainbow trout was calculated to be 7,300 ppm. On exposure to 2,500 ppm the period of time to reach 50% mortality was 275 hours. The fish kept at 2,500 ppm or greater showed definite signs of illness before dying. The first effects of a loss of reaction to sudden movements and swimming behavior close to the water surface was followed by rapid and irregular breathing. Death was preceded by loss of coordination and the fish lying on their sides before finally dying, the results indicated that lignosulphonates may be an important factor in the effluent toxicity of sulphite spent liquor (SSL) found in pulpmill wastes responsible for fish mortality. (Klein)

MERCURY LEVELS IN FRESHWATER FISH OF THE STATE OF SOUTH CAROLINA, South Carolina State Coll., Orangeburg. Dept. of Natural Sciences. For primary bibliographic entry see Field 5A. W77-1222.

FATE OF POLYCHLORINATED BIPHENYL (AROCLOR 1242) IN AN EXPERIMENTAL STUDY AND ITS SIGNIFICANCE TO THE NATURAL ENVIRONMENT, Australian National Univ., Canberra. Dept. of Prickerical Sciences.

Australian National Univ., Canberra. Dept. of Biological Sciences. For primary bibliographic entry see Field 5B. W77-12224

THE EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SUR-VIVAL AND BEHAVIOR OF COASTAL AND OCEANIC ZOOPLANKTON,

Texas Univ. at Austin, Port Aransas. Marine

W. Y. Lee, and J. A. C. Nicol. Environmental Pollution, Vol. 12, p. 279-292, 1977. 5 fig. 2 tab. 24 ref.

Descriptors: *Fuels, Oil, *Zooplankton, Chemistry, Population, *Productivity, *Mortality, *Toxicity, *Oil wastes, Toxins, Resistance, Aquatic life, Plankton, *Oil pollution, Water pollution sources, Lethal limit, Animal behaviour. Identifiers: Water soluble fractions(Oil), No. 2 fuel oil, Survival rates, Coastal zooplankton, Petroleum hydrocarbons

Acute effects of water-soluble fractions (WSF) of No. 2 fuel oil on both coastal and oceanic zooplankton were studied and their LC50 for various exposure time (1 to 72 h) compared. Coastal zooplankton seemed to be more resistant to the WSF than oceanic zooplankton. This difference was probably caused mainly by the dissimilar species composition of the two zooplankton popula-tions under investigation. The evidence from this study indicates that, on a species or taxon basis, there are some species in coastal waters more vul-nerable to oils than among oceanic zooplankton and it is strongly recommended that further studies of the tolerance of both populations to various petroleum hydrocarbons be carried out at the same time. A vital staining method was used to distinguish the dead from the immobile forms. Expected variations both in the curves of mortality compared with time and in the curves of mortality compared with concentration of oil are explained and a possible method to decrease variability is suggested. Change of behaviour of coastal zooplankton due to WSF of No. 2 fuel oil was also rved during the first hour of exposure. (Katz)

EFFECTS OF HIGH STABILITY IRON-COM-PLEXES ON THE KINETICS OF IRON ACCU-MULATION AND EXCRETION IN MYTILUS EDULIS (L.), Institute of Marine Biochemistry, Aberdeen

(Scotland). For primary bibliographic entry see Field 5B. W77-12228

RESIDUES OF CHLORINATED HYDROCAR-BONS IN NORTH SEA ANIMALS IN RELATION TO BIOLOGICAL PARAMETERS,

Institut fuer Meeresforschung, Bremerhaven (West Germany). For primary bibliographic entry see Field 5B. W77-12229

DISPOSITION OF DIELDRIN IN FOUR COM-PONENTS OF TWO ARTIFICIAL AQUATIC SYSTEMS AND A FARM POOL,
Georgia Univ., Athens. School of Forest

Resources. For primary bibliographic entry see Field 5B. W77-12230

THE EFFECTS OF DIFFERENT ALKALI SALTS ON GROWTH AND MINERAL NUTRIENT OF LEMNA MINOR L. (EFFECT DE DIVERS SELS ALCALINS SUR LA CROISSANCE AT AL NUTRITION MINERALE DE LEMNA MINOR

Dijon Univ. (France). Labortoire de Physiologie

Internationale Revue Gesamten Hydrobiologie, Vol 61, No 5, p 673-676, 1976. 3 tab, 7 ref.

Descriptors: *Salts, *Growth rates, *Productivity, *Sodium compounds, *Chlorides, Plant physiolo-

gy, Aquatic plants, Environmental effects, Nutrients, Nutrient requirements, Inorganic compounds, Potassium.
Identifiers: *Lemna minor, Sodium chloride,

Lithium chloride.

inor was grown in aseptic culture solutions. With sodium chloride or lithium chloride in the solution, the plant increased in yield. Tolerance of Lemna minor to relatively high level of sodium explains the presence of this plant in brackish waters. A low quantity of potassium was required for optimal growth. Sodium was added to nutrient solutions as chloride or sulphate. At equivalent levels the sodium content of the plant as somewhat higher under sulphate salinity. (Katz) W77-12231

GROWTH OF SPIRODELA POLYRHIZA IN STATIC SEWAGE EFFLUENT, Agricultural Research Center, Fort Lauderdale,

D. L. Sutton, and W. H. Ornes

Aquatic Botany, Vol 3, p 231-237, 1977. 1 fig, 2 tab. 17 ref.

Descriptors: *Productivity, *Growth rates, Aquatic plants, *Sewage effluents, *Plant growth, *Aquatic weeds, Plant physiology, Metabolism, Wastes, Water quality, Water pollution, Water *Aquatic weeds, 1 mm, Water pollic Wastes, Water quality, Water pollic cources, *Potassium, Biochemistry, Facergy, Nutrients.
Identifiers: Spirodela polyr
duckweed, Tissue analysis, B *Nitrogen,

odela polyrhiza, *Giant analysis, Bioaccumulation, Secondary sewage.

Yield of the giant duckweed Spirodela polyrhiza Shleid. Grown in secondarily treated sewage ef-fluent held under static conditions was highest for the 7th-week harvest during a 12-week growth period. Concentrations of phosphorus in plant tis-sue were closely associated with orthophosphate phosphorus (P) in the effluent. Potassium, nitrogen (expressed as crude protein), and caloric contents of the plant tissue were higher at the beginning of the growth period than at the end. W77-12232

FIELD STUDIES OF SHELL REGROWTH AS A BIOINDICATOR OF EASTERN OYSTER (CRASSOSTREA VIRGINICA GMELIN) RESPONSE TO 2,4-D BEE IN MARYLAND

TIDEWATERS, Maryland Univ., Solomons. Chesapeake Biological Lab.

For primary bibliographic entry see Field 5A. W77-12233

ORGANOCHLORINE POISONING OF RING-BILLED GULLS IN SOUTHERN ONTARIO, Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch.

L. Sileo, L. Karstad, R. Frank, M. V. Holdrinet,

and E. Addison.

Journal of Wildlife Diseases, Vol 13, p 313-322, 1977. 3 tab, 43 ref. *Polychlorinated

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, *Dieldrin, *DDE, *Gulls, Path of pollutants, Mortality, Toxicity, Animal physiology, Analytical techniques, Water birds.

Identifiers: *Ring-billed gulls, Bioaccumulation, Tissue analysis.

Clinical, necropsy, bacteriologic, parasitologic, histopathologic, toxicologic and animal inoculation studies suggested that organochlorine (PCB, dieldrin and DNE) poisoning was an important factor in causing deaths of free-flying ring-billed gulls (Larus delawarensis) in souther Ontario in 1969 and 1973. The brains of gulls dying with clini-cal signs of nerologic involvement, and dead gulls

with not other apparent cause of death, contained organochlorine residues of significantly greater levels than those found in healthy gulls shot for comparison. (Katz) W77-12234

BEHAVIOURAL, HAEMATOLOGICAL AND HISTOLOGICAL STUDIES ON ACUTE TOXICI-TY OF BIS (TRI-N-BUTYLTIN) OXIDE ON SALMO GAIRDNERI RICHARDSON AND TILAPIA RENDALLI BOULENGER, Geneva Univ. (Switzerland). Department de

Biologie Animale.

Y.-P. Chliamovitch, and C. Kuhn. Journal of Fish Biology, Vol. 10, No. 5, p 575-586, 1977. 3 fig, 4 tab, 1 plate, 3/ ref.

Descriptors: *Salmonids, Trout, *Rainbow trout, *Toxicity, Organic compounds, *Pesticides, Fish physiology, *Fish behavior, *Path of pollutants, Metabolism, Respiration, Environmental effects, Mode of action, Cytological studies, Mathematical studies, Analytical techniques. Identifiers: Bioaccumulation, Histology, Tissue analysis, *Bis(Tri-n-butyltin), Oxide Tin, Organic tin compound

In acute toxicity tests based on the loss of positive rheotaxis, the relationship between exposure time and bis (tri-n-butyltin) oxide concentration was determined for Salmo gairdneri and Tilapia rendal-li. The 24-h EC50 is 30.8 microg/1 for trout and 53.2 microg/1 for T. rendalli. A histopathological study on S. gairdneri shows concentrations from 5.85 to 0.0117 mg TBTO/1 resulted in damage to the gill epithelium. At low concentrations a degeneration of the cornea and damage to the ithelial cells of bile ducts were also observed. Prior to a loss of positive rheotaxis and with con-centrations from 0.023 to 1.17 mg/1, the packed cell volume, the haemoglobin concentration and erythrocyte count increased. Determination of the mean cell volume showed swelling took place at 1.17 mg/l but shrinkage was observed at 0.053 mg/l. These results indicate that TBTO interfered with the process of respiration. A 'safe level' (0.1 microg/1) is proposed for schistosomiasis control. (Katz) W77-12235

MESENCHYMAL TUMORS OF SOME ESTUARINE FISHES OF THE NORTHERN GULF OF MEXICO. I. SUBCUTANEOUS TU MORS, PROBABLY FIBROSARCOMAS, IN THE STRIPED MULLET, MUGIL CEPHALUS, Air Force Medical Center Keesler, Keesler AFB, Miss

R. H. Edwards, and R. M. Overstreet. Bulletin of Marine Science, Vol. 26, No. 1, p 33-40, 1976. 16 fig, 13 ref.

Descriptors: *Fish physiology, *Mullets, *Estuaries, *Gulf of Mexico, *Marine fish, *Pathology, Path of pollutants, Environmental effects, Toxicity, Water quality, *Water pollution effects, Laboratory tests, Analytical techniques. Identifiers: Tissue analysis, *Striped mullet, Tumors, *Mesenchymal tumors

Fibrous tumors occurring in the subcutaneous tis-sues of five striped mullet taken from Mississippi Sound were reported. These nonpedunculated tumors were associated with ulceration of the over-lying integument. Affected mullet exhibited 1 to 10 typing integument. Affected mulet exhibited 1 to 10 to the mors on most surface-areas of the body, excluding the fins. Consisting primarily of fibroblast-derivatives, these well- to poorly-differentiated tumors are considered pathologically malignant, i.e., fibrosarcomas. Invasion into and nearly through the fascia overlying the muscle, focal necrosis, and cellular atypia support this interpretation. Metastases were not observed. Thus, these tumors represent benign fibromatoses or fibromas. A possible relationship between these neoplasms in the mullet and increasing pollution in Mississippi Sound were suggested. (Katz)

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EFFECT OF FERRIC HYDROXIDE SUSPEN-SION ON BLOOD CHEMISTRY IN THE COM-MON SHINER, NOTROPUS CORNUTUS, Grove City Coll., Pa. Dept. of Biology. F. J. Brenner, S. Corbett, and R. Shertzer. Transactions of the American Fisheries Society, Vol. 105, No. 3, p 450-455, 1976. 4 fig, 35 ref.

Descriptors: *Shiners, Freshwater fish, *Fish physiology, *Iron compounds, Ions, Iron, Proteins, Organic compounds, Biochemistry, Metabolism, Laboratory tests, Water quality, Environmental effects, Carbohydrates, Metals, Potassium, Sodium.

Identifiers: *Common shiner, *Ferric hydroxide, Blood chemistry, Glucose, Hematology, Serum proteins, Blood sugar.

Common shiners, Notropus cornutus, were exposed to 3 ppm ferric hydroxide for periods from two to eight weeks. Ferric hydroxide resulted in initial changes in serum protein, glucose, Na and K ions, but these changes did not adversely affect the internal dynamics of the fish. (Katz)

MERCURY IN THE SESTON OF THE SAN FRANCISCO BAY ESTUARY, Moss Landing Marine Labs., Calif.

A. R. Flegal. Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p 733-738, 1977. 1 fig, 3

*Mercury, *Sesson, Estuaries, Descriptors: Metals, Phytoplankton, *Zooplankton, Estuaries, Detritus, Path of pollutants, Distribution, Sediments, Sampling, Biota, Laboratory tests, Size, Organic matter, Estuaries, Water pollution effects, California Identifiers: *San Francisco Bay, Bioaccumulation.

The macro-seston (>20 micro m) of the San Francisco Bay system contained relatively high con-centrations of mercury, compared with other estuaries. These levels varied temporally and spatially, as well as with the size fraction of the seston and its organic content. They appeared to be higher in the phytoplankton and/or organic detritus than in the zooplankton. (Katz) W77-12238

TOXICITY OF TETRACHLORODIBENZO-P-DIOXIN IN LAR-VAL AND ADULT FORMS OF RANA CATESBEIANA,

Vanderbilt Univ., Nashville, Tenn. Dept. of Biochemistry.

P. W. Beatty, M. A. Holscher, and R. A. Neal. Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 5, p 578-581, 1976. 1 tab,

Descriptors: *Toxicity, *Chlorinated hydrocarbon pesticides, *Organic compounds, *Mortality, *Path of pollutants, *Frogs, *Amphibians, Lar-vae, Mature growth stage, Growth stages, Animal physiology, Metabolism, Biochemistry, Analytical

Identifiers: *American bullfrog, Rana catesbeiana, Bioaccumulation, Tissue analysis. Tetrachlorodibenzo-p-dioxin, Larval

Varying doses of TCDD ranging from 25 to 1000 microg/kg were administered to the larval and adult forms of the American bullfrog. Doses of TCDD as high as 1 mg/kg failed to have any significant effect upon survival or completion of metamorphosis in tadpole and doses of up to 500 microg/kg had no effect on survival of adult frogs. Histopathological examination of various tissues from the metamorphosed tadpoles and adult frogs failed to show any abnormalities. (Klein) DISTRIBUTION OF N-PARRAFINS IN SELECTED MARINE BENTHIC ORGANISMS, Texas A and M Univ., College Station. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W77-12241

CONTRIBUTIONS TO ECOLOGICAL CHEMIS-TRY CXV METABOLISM OF 2,5,4,
TRICHLOROBIPHENYL-14C AND 2,4,6,2,4, 2.5.4. PENTACHLOROBIPHENYL-14C IN T MARSH PLANT VERONICA BECCABUNGA. Gesellschaft fuer Strahlen-und Unweltforschung

m.b.H., Neuherberg bei Munich (West Germany). Institut fuer Okologische Chemie.

P. Moza, L. Kilzer, I. Weisgerber, and W. Klein. Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 4, p 454-463, 1976. 2 fig, 3 tab, 13 ref.

Descriptors: *Polychlorinated biphenyls, *Organic compounds, *Plant tissues, *Chlorine, *Marsh plants, Chemistry, Chemical reactions, Metabolism, Adsorption, Plant physiology, Analytical techniques, Water pollution effects. Identifiers: *Veronica beccabunga, Tissue analysis, Trichlorobiphenyl, Pentachlorobiphenyl.

Under the experimental conditions used, 2,4,6,2,4,-pentachlorobiphenyl was more persistent than 2,5,4,-trichlorobiphenyl. 2,5,4,-Trichlorobiphenyl was metabolized to at least two monohydroxy derivatives which occurred in free form as well as conjugated in the plant tissues. W77-12243

SOME CHANGES IN POND CHEMISTRY AND PHOTOSYNTHETIC ACTIVITY FOLLOWING TREATMENT WITH INCREASING CONCEN-TRATIONS OF CHLORPYRIFOS, York Univ., Downsview (Ontario), Dept. of Biolo-

J. E. Butcher, M. G. Boyer, and C. D. Fowle. Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6 p 752-758, 1977. 4 fig,

Descriptors: *Organophosphorus compounds, *Organophosphorus pesticides, *Algae, *Organophosphorus pesticides, *Algae, *Productivity, *Growth rates, *Photosynthesis, Phosphorus compounds, Organic compounds, Ponds, Water pollution sources, Zooplankton, Mortality, Environmental effects, Primary productivity, Nutrients, Eutrophication. Identifiers: *Chlorpyrifos, Photosynthetic activi-

The organophosphorus pesticide chlorpyrifos brought about an enhancement of algal growth. The virtual complete elimination of zooplankton by 48 hours followed by the development of algal blooms supported the concept of reduced grazing pressure as an explanation for the initiation of blooms by the pesticide. Evidence also supported a partial role for other factors. The correlation between the size and persistence of the algal blooms and the concentration of the pesticide led to a suggestion that a required element such as phosphorus may be a major factor in the total magnitude of the response and in the variation in species. (Klein) W77-12244

THE INFLUENCE OF LARVAL LAMPRICIDE 3-TRIFLUORMETHYL-4-NITROPHENOL) ON GROWTH AND PRODUC-TION OF TWO SPECIES OF AQUATIC MACROPHYTES, ELODEA CANADENSIS (MICHX.) PLANCHON AND MYRIOPHYLLUM SPICATUM L.,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife. A. W. Maki, and H. E. Johnson.

Bulletin of Environmental Contamination and Toxicology, Vol 17, No 1, p 57-65, 1977. 2 fig, 3

Descriptors: *Pesticides, *Growth rates, *Toxicity, *Aquatic plants, *Organic compounds, Plant physiology, Halogenated pesticides, Phenols, Mortality, Productivity, Plant growth, Resistance, Piscicide. Identifiers: *Larval lampricide, *TFM, *Aquatic macrophytes, Elodea canadensis, Myriophyllum sonicatum.

spicatum.

TFM inhibited the growth and production of vegetative shoots of Elodea canadensis in concentrations greater than 5.0 mg/1. Myriophyllum spicatum was more susceptible to the toxicant. TFM appeared to affect both species similarly. Within 48-72 hr following exposure the plants from the higher TFM concentrations became evanotic and lost turgor. Leaves of the affected plants began to slough off and the entire plant rapidly deteriorated during the 2nd week of the growth period. With increasing TFM concentrations and exposure periods progressively more severe ef-fects were observed. (Katz)

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,

Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.

L. W. Harding, Jr. Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 559-566, 1976. 1 fig, 3 tab, 32 ref.

*Polychlorinated Descriptors: biphenvls. Folyemorimated oppolity, Inhibition, *Toxicity, *Photosynthesis, *Phytoplankton, Organic compounds, Environmental effects, Biological communities, Productivity, Water quality, Aroclor, Water pollution ef-Identifiers: *Adriatic Sea.

An evaluation of PCB-induced photosynthetic inhibition of natural phytoplankton assemblage was described. Phytoplankton communities from different temporal regimes exhibited distinct photosynthetic responses to PCB addition. There existed substantial horizontal gradients with re-gard to nutrient material of biotic and abiotic origin and presumably contamination. For these reasons determinations of polychlorinated biphenyl concentrations necessary to eli photosynthetic inhibition were difficult. (Klein) W77-12246

EFFECTS OF OUTBOARD MARINE ENGINE EXHAUST ON THE AQUATIC ENVIRON-

Environmental Control Corp., Ann Arbor, Mich. For primary bibliographic entry see Field 5B.

THE INFLUENCE OF CATIONS ON CHLORINE TOXICITY

Florida Inst. of Tech., Melbourne. Dept. of Biological Sciences. G. M. Cohen.

Bulletin of Environmental Contamination and Toxicology, Vol 18, No 2, p 131-137, 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Toxicity, *Chlorine, *Ions, *Cations, Ion exchange, Ion transport, Cation adsorption, Fish, Analytical techniques, Fish physiology, Mode of action, Metabolism, Resistance, Respiration, Mortality. Identifiers: *Mosquito fish, Tissue analysis.

Results demonstrated that cations markedly modified chlorine toxicity to the mosquito fish

W77-11573

Gambusia affinis. 25% sea water and 0.125% NaC1 most effectively reduced toxicity to 0.5 ppm chlorine over controls, in comparison to tap or custome over controls, in comparison to tap or other waters. When chlorine concentrations were raised, mortalities increased in all waters. Physiological explanations for chlorine resistance were discussed. (Klein)

5D. Waste Treatment Processes

CHARACTERISTICS OF POULTRY PROCESSING EFFLUENT, Rockingham Poultry Market Coop., Inc., Broadway, Va. For primary bibliographic entry see Field 5B. W77-11531

DECONTAMINATING LAKE SUPERIOR OF ASBESTOS FIBERS, Army Mobility and Equipment Research and

Development Center, Fort Belvoir, Va. R. P. Schmitt, D. C. Lindsten, and T. F. Shannon Environmental Science and Technology, Vol 11, No 5, May 1977, p 462-465. 2 tab, 4 fig.

Descriptors: *Water pollution, Industrial wastes, Asbestos, Lake Superior, *Water pollution treatment, Coagulation, Disinfection, Filtration, *Waste water treatment, Water treatment.

A U.S. Army Water Purification Equipment Unit was used in the study. The equipment consists of a conical shaped solids contact clarifier and a pres-sure diatomite filter. The basic processes involved are coagulation, disinfection, and filtration. Nine are coagulation, disinfection, and filtration. Nine different variations of operations were used on Lake Superior water with best results being obtained with the following procedure: (1) coagulation, 2 ppm cationic polyelectrolyte; (2) filtration, precoat, 0.4 lbs celite 535, body feed, 28 ppm Hyflo. The results indicated that charge neutralization, bridging and filtration are the logical approach to the asbestos decontamination of Lake Superior. (Chilton-ORNL)

MAKING WASTE WATER PURER STILL, Department of the Environment, Stevenage dand). (Er

A. L. Downing. Public Health, Vol. 76, No. 12, p 372-374, December 1976

Descriptors: *Sewage treatment, Tertiary treatment, Effluents, Water reuse, Nutrient removal, Activated carbon, Adsorption, Sludge, Water quality standards, *Waste water treatment. Identifiers: South Africa, United Kingdom.

Effluent quality can be thought of in terms of five broad categories:- (1) Effluent which would not generally produce serious evidence of pollution in a river unless present in high concentration, but which would contain too many impurities to be permissible in a river used as a source of water for drinking (and in some circumstances could cause unwelcome growths of algae). (2) Effluent tolerable if well diluted in rivers used as a source of water for public supply. (3) Effluent of similar characteristics except that, in addition, its content of nutrients capable of promoting excessive growths of algae would be much reduced. (4) Ef-fluent hardly distinguishable from tap water in apthen hardly distinguishable from tap water in appearance and of a sufficiently high standard to be used directly as a source of water for all but the most taxing industrial uses. (5) Effluent (reclaimed water) of potable quality. It is feasible to produce potable water from sewage effluent by giving further treatment to effluent of the second category. ry. The following treatment processes are discussed:- Micro-straining followed by ozonation; chemical coagulation and sand filtration, separation of detergents by foaming, chemical

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coagulation, sand filtration and chlorination; reverse osmosis; activated carbon/adsorption and incineration; lime flocculation; and oxidizing of impurities at high temperature and pressure. (So African Water Info Center) W77-11548

POSSIBILITIES OF WASTE RECYCLING IN SOUTH AFRICA - CHOICES AND CONFLICTS, Johannesburg City Health Services (South Africa)

Municipal Administration and Engineering, Vol 42, No 485, p 49-55, 1976. 1 tab.

Descriptors: *Recycling, *Municipal wastes, *Solid wastes, Rubber wastes, Waste disposal, Incineration, Pyrolysis, Hydrolysis, Costs, Landfill, Planning, Transportation, Economics, Administration, Pulp wastes, *Water reuse.

Identifiers: *South Africa, Johannesburg, Wit-

The author discusses possible recycling routes for solid urban wastes. The composition and assumed value of the components of urban refuse are tabulated. Direct recovery of materials and the recovery of heat energy from refuse are discussed in detail. (See also W77-11552) (So African Water Info Center).

POSSIBILITIES OF WASTE RECYCLING IN SOUTH AFRICA - II,

Johannesburg City Health Services (South Africa). V. Bolitho.

Municipal Administration and Engineering, Vol 42, No 486, p 15-24, 1976. 2 tab.

Descriptors: *Recycling, *Municipal wastes, *Solid wastes, Rubber wastes, Waste disposal, Incineration, Pyrolysis, Hydrolysis, Costs, Landfill, Planning, Transportation, Economics, Administration, *Water reuse, Pulp wastes.

Identifiers: *South Africa, Johannesburg, Witwatersrand.

The conclusion of a previous article under the same title. Mechanised recovery processes, markets for recovered solid waste components, and special problems concerning polythene and rubber are discussed, as well as pyrolysis, cellulose upgrading, hydrolysis, landfill, and the alternative strategy of limiting the quantity of waste. The author investigates newsprint, packaging, resources, heat recovery, urban planning and transportation, the energy requirements of materials recovery, and regional administration of recycling. He concludes that the most economic recycling procedure in South Africa in the immediate future is the creation of recreation areas and the reclamation of derelict land. (See also W77-11551) (So African Water Info Center). W77-11552

PIPES IN SEWERAGE AND PLASTIC DRAINAGE.

For primary bibliographic entry see Field 8G. W77-11554

BALL CLEANING OF SEWER PIPES. National Building Research Inst., Pretoria (South For primary bibliographic entry see Field 8G. W77-11566

STUDIES ON DISINFECTION AND CHEMICAL OXIDATION WITH OZONE AND CHLORINE IN WATER RECLAMATION, National Inst. for Water Research, Pretoria (South

For primary bibliographic entry see Field 5F. W77-11572

HEALTH ASPECTS OF POTABLE WATER SUPPLIES.

National Inst. for Water Research, Pretoria (South Africa). For primary bibliographic entry see Field 5F.

EFFECTIVE PHOSPHORUS REMOVAL FROM SEWAGE BY BIOLOGICAL MEANS.

National Inst. for Water Research, Pretoria (South

A. R. McLaren, and R. J. Wood. Water SA., Vol. 2, No. 1, p 47-50, 1976. 1 tab, 5 fig, 5 ref.

Descriptors: *Phosphorus, Sewage treatment, Biological treatment, Anaerobic treatment, Activated sludge, Nitrification, Denitrification, Waste water treatment. Identifiers: South Africa

The effect of including an anaerobic stage on phosphorus removal in nitrifying-denitrifying activated sludge units was investigated. On laboratory as well as pilot-plant scale almost complete elimination of phosphorus was achieved when the sludge was passed through an anaerobic stage in phosphorus release was effected. mechanism of phosphorus removal was investigated in batch reactors. (So African Water W77-11574

REMOVAL OF MICROCYSTIS TOXINS IN WATER PURIFICATION PROCESSES,

National Inst. for Water Research, Pretoria (South

For primary bibliographic entry see Field 5A. W77-11576

A GUIDE FOR THE DESIGN OF DISSOLVED-AIR (PRESSURE) FLOTATION SYSTEMS FOR ACTIVATED SLUDGE PROCESSES,

Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering. J. Bratby, and G. vR. Marais.

Water SA., Vol. 2, No. 2 p 87-100, 1976. 20 fig, 8

Descriptors: *Design criteria, Flotation, Activated sludge, Sedimentation, Suspended solids, Sludge thickening, Sludge, Settling basins, Pilot plants, Waste water treatment. Identifiers: South Africa.

The relative merits of dissolved-air (pressure) flotation and sedimentation applied to activated sludge mixed liquor are discussed. In thickening waste sludge by flotation, it is advantageous to withdraw sludge from the reactor rather than from, say, the under-flow from a sedimentation basin. Design criteria for dissolved-air (pressure) flotation systems applied to activated sludge are presented based on investigations at pilot-scale level. To illustrate usage of the design data, two design examples are presented in detail: the first is applicable to instances where only clarification of the whole mixed liquor flow is required (that is, flotation taking the place of secondary sedimentation). The second example is applicable to instances where thickening (and, necessarily, clarification) of the waste sludge from the system is required. (So African Water Info Center)

TRADITIONAL METHODS OF WATER PURIFICATION IN THE RIVERAIN SUDAN IN RELATION TO GEOGRAPHIC AND SOCIOECONOMIC CONDITIONS, S. A. A. Jahn

Erdkunde (Germany), Vol 31, No 2, p 120-130, June 1977. I fig, 2 tab, 30 ref.

Group 5D—Waste Treatment Processes

Descriptors: *Water purification, *Suspended solids, *Filtration, *Water quality, Africa, Sediload, Sediments, Sedimentation, Rivers, Floods, Water pollution, Coagulation, Clays, Flocculation, Soils, Polymers, Waste water treatment. Identifiers: Sudan, Nile River.

The suspended solids in the waters of the Blue Nile, the River Nile and their tributaries show a great annual increase during the flood season. The traditional methods of water purification practiced during the flood season of the Nile in rural areas of the riverain Sudan are discussed. The most important traditional method of water purification in the area is the use of natural coagulants added in suspension or as an extract to the turbid water of the water jars in order to achieve floc formation Every household is able to improve the quality of its water by this means. The arabic word 'Rauwaq' means clarifier. It is not a name for a specific sub stance, but a general term for any type of material empirically found to coagulate turbid water. People in the riverain Sudan use the term mainly for clay soil which has these properties. The legendary origins of this method of water purification are discussed in detail. Water purification with plants is also described. The social aspects of traditional water purification are evaluated and the economic aspects of Nile water consumption during the flood season are treated. (Jamail-Arizona) W77-11620

SUSPENDED SOLIDS MEASUREMENT GIVES

IMPROVED CONTROL, Instruments (H. F.) Ltd., Bolton (Ontario). .s. S. Posgate.

Water and Wastes Engineering, p 31-36, March 1977. 5 fig.

Descriptors: *Suspended solids, *Treatment facili-ties, *Measurement, *Instrumentation, *Monitoring, *Waste water treatment, Economic efficiency, Industrial plants, Gravimetric analysis, Industrial water, Slurries, Polymers, Effluents, Costs, Turbidity. Identifiers: *Turbidimeters.

Turbidimeters adapted for monitoring and control at water and wastewater plants can reduce costs by pacing chemical input to actual demand. A simple method is presented for combining the standard gravimetric analysis with linear instruments to provide direct measurement of suspended solids in ppm. The method can be applied at water plants, industrial waste plants, and at sewage treatment plants with a reasonably stable influent. Suspensions that can be directly monitored are discussed. Possible sewage plant applications include moni-toring the activated sludge concentration and controlling the flowrate for return to the primary stage; proportioning the input of polymers in waste sludge de-watering systems; and use in advanced tertiary waste treatment systems. In water treatment plants, it is most economical to proportion the chemical input to variations in raw water suspended solids concentration. Linearity and immediate response are the most important factors in cost reductions at sewage plants and water treatment plants are outlined. (Jahns-Arizona) W77-11624

CHEMICAL TECHNOLOGY AND ECONOMICS IN ENVIRONMENTAL PERSPECTIVES: TASK II. REMOVAL OF BORON FROM WASTE-WATER, Midwest Research Inst., Kansas City, Mo.

ANIAWEST RESEARCH INST., KANSAS City, Mo. T. W. Lapp, and G. R. Cooper.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 919, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-560/1-76-007, June 1976. 27 p, 7 tab, 37 ref.

Descriptors: *Boron, *Public health, *Water pollution control, *Sewage treatment, *Trace elements, *Waste water treatment, Industrial wastes, Municipal wastes, Chemical oxygen demand, Activated sludge, Salts, Ion exchange, Separation techniques, Chemical precipitation.

Objectives of this study on the removal of boron from waste water were to assess public concern over the presence of boron in effluents, examine current practices and literature on boron removal. and determine the role that boron plays in the ac-tivated sludge process. Surveys determined that no sewage treatment facilities and very few boronproducing or -consuming industries were attempting to remove boron from their wastes. A literature survey on the effects of boron on sewage treatment processes indicated that in large quantities (greater than 10 ppm) boron may inhibit biological processes and COD removal, but the effect was largely dependent on individual circumstances. ree methods of boron removal are discussed, including the use of ion exchange resins, lime precipitation, and liquid-liquid extractions. (Schulz-FIRL)

MCALPINE WIN EFFLUENT TREATMENT WORKS CONTRACTS.

Water Services, Vol 81, No 976, p 367-368, June,

Descriptors: *Treatment facilities, *Suspended solids, "Hydrogen ion concentration, "Fumping plants, "Waste water treatment, Waste treatment, Municipal wastes. Identifiers: Huddersfield(UK), Lancashire(UK).

Two contracts for the construction of waste water treatment facilities have been awarded to Sir Alfred McAlpine and Son Ltd., England. A new ef-fluent pre-treatment plant including a replacement pumping station will be constructed for ICI Ltd., Organics Division, at its Dalton works in Hudder-sfield. This plant is designed to comply with the Yorkshire Water Authority's requirements on pH

and suspended solids levels in discharged effluent. The second contract was awarded by Ward Blenkinsop and Company Ltd. for the construction of ent facilities which will include a twin 50 mm outfall sewer, pumping station, tanks, control house, lagoons, pipes, and roads. (Schulz-FIRL) W77-11667

ENHANCEMENT OF HIGH-RATE DISINFEC-TION BY SEQUENTIAL ADDITION OF CHLORINE AND CHLORINE DIOXIDE,

O'Brien and Gere Engineers, Inc., Syracuse, N.Y. E. C. Tifft, P. E. Moffa, S. L. Richardson, and R.

Journal Water Pollution Control Federation, Vol 49, No 7, p 1652-1658, July, 1977. 2 fig, 9 tab, 10

Descriptors: *Disinfection, *Chlorination, *Combined sewers, *Overflow, Storm water, Bactericides, *Waste water treatment, Water Pollution Control Federation, Model studies. Identifiers: *Chlorine dioxide.

Combined waste water overflows due to use of interceptor sewer systems for both normal waste waters and storm water runoff are a major source of microbial contamination of surface waters. Several methods for the high-rate point source treatment of microbial contamination have been investigated. As the cost, availability, and possible carcinogenicity of chlorine may restrict future dis-infection by chlorine alone, the use of C102 in combination with C12 has been considered. In laboratory studies to determine the approximate dosages of C12 and C102 necessary to adequately reduce the microbial count, C12 and C102 were applied individually and sequentially during single-and two-stage studies on a simulated combined waste overflow. The treatment method included fine-mesh screening prior to disinfection. Two full-scale facilities were used to verify findings. Studies concluded that C102 at 12 mg/liter had the same bacterial and viral killing capacities as C12 at 25 mg/liter in two minutes contact time. In a two-stage addition treatment, C12 at 8 mg/liter followed by C102 at 2 mg/liter also accomplished the same disinfection as C12 at 25 mg/liter. Although the effects of the chlorite ion as a byproduct of disinfection with C102 are not known, it is suggested that the use of C102 in conjunction with C12 to enhance disinfection may significantly reduce treatment costs. (Schulz-FIRL)

PLANNING FOR URBAN STORMWATER CON-

TROL, Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla.

For primary bibliographic entry see Field 5G. W77-11669

THE INVESTIGATION OF SEWER NETWORKS

BY COMPUTER, London Borough of Hammersmith (England). Directorate of Engineering. For primary bibliographic entry see Field 5G. W77-11670

MUNICIPAL WASTEWATER TREATMENT PLANT SLUDGE AND LIQUID SIDESTREAMS, Camp, Dresser, McKee, Inc., Boston, Mass. A. A. Kalinske.

A.A. Adulaske. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-255 769, Price codes: A06 in paper copy, A01 in microfiche. Report EPA 430/9-76-007, June 1976. 123 p, 3 fig, 4 tab, 204 ref, 1 append.

Descriptors: *Sludge treatment, *Dewatering, *Sludge digestion, *Filtration, *Incineration, Reviews, Separation techniques, Sewage treat-ment, Tertiary treatment, *Waste water treatment.

A general review of municipal waste water treat-ment plant sludge and liquid sidestreams is presented. Sludge characteristics are discussed for primary treatment, secondary treatment with trickling filters or activated sludge treatment, chemical treatment, and septic tanks. Various physical, biological, and chemical methods of sludge stabilization are described. Sludge thickening by gravity thickening, pressurized-air flotation, and centrifugation is discussed. Supernatants from biological digesters are considered with respect to aerobic and anaerobic digestion, treatment methods, and elutriation. Chemical condi-tioning, thermal treatment, and freezing are examined for sludge conditioning. Sludge dewatering and sidestreams produced by sand beds, vacuum filtration, centrifugation, filter presses, and screens are discussed. Various methods of sludge disposal considered include incineration, wet air (high-pressure) oxidation of liquid sludge, land application, landfill disposal, ocean and surface pucation, janutii disposai, ocean and surface water disposal, deep well or underground injec-tion, pyrolysis, and composting. Sludge reclama-tion and tertiary treatment methods are con-sidered. (Schulz-FIRL.)

DISINFECTION OF WASTEWATER, TASK FORCE REPORT.

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FORCE REPORT.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 449, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-430/9-75-012, March, 1976. 59 p, 1 fig, 14 tab, 24 ref, 4 append.

Descriptors: *Chlorination, *Ozone, *Bromides, *Ultraviolet radiation, *Disinfection, Halogens, Chlorides, Chemical reactions, Toxicity, Public

health, *Waste water treatment, Costs, Aquatic life, Fish, Effluents.

A task force survey of various aspects of waste water disinfection is presented. Major topics discussed include possible toxic effects of chlorination on aquatic life and humans, public health considerations, and disinfection me Recognition of the potential danger of the forma-tion of halogenated organic compounds as a result of chlorination has prefaced an investigation into alternative disinfectants such as ozone, bromine chloride, and ultraviolet light. Dechlorination with sulfur dioxide and activated carbon is examined. Task force recommendations include disinfection of waste water wherever required to maintain public safety, further investigation of alternate disinfectants, modification of present disinfection standards for more flexibility, and close monitor-ing of residual chlorine levels in receiving waters. (Schulz-FIRL) W77-11672

NITRIFICATION AND HEAVY METAL REMOVAL IN THE ACTIVATED SLUDGE TREATMENT PROCESS,
Texas A and M Univ., College Station. Dept. of

Civil Engineering. P. A. Richards.

Available from the National Technical Information Service, Springfield, VA 22161 as ADJA-031 748, Price codes: A09 in paper copy, A01 in microfiche. Report ADJA-031 748, August 1976. 172 p, 23 fig, 22 tab, 101 ref.

Descriptors: *Heavy metals, *Silver, *Chromium, *Activated sludge, *Nitrification, *Sludge treatment, Physicochemical properties, Chemical reactions, Separation techniques, Model studies, *Waste water treatment, Sewage treatment, Ef-

The purpose of this dotoral dissertation was to exeavy metal concentrations in municipal sewage with respect to nitrification and various points within an activated sludge waste treatment system. A laboratory-scale, continuous flow, completely mixed activated sludge system was used to examine removal of silver and chromium from synthetically produced waste. Heavy metal removal was observed to be positively related to sludge production rate, sludge metal concentra-tion, and sludge wasting rate of metal-rich sludge. uon, and shouge wasting rate of metal-rich shudge. Metal removal was negatively related to system metal loading rate and wasting rate of metal-poor sludge. (Schulz-FIRL) W77-11673

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE TO METHANE,

Environmental Protection Agency, Cincinnati, Ohio. Office of Solid Waste Management Pro-

Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 091, Price codes: A02 in paper copy, A01 in microfiche. Report EPA/530/SW-159, July 1975. 13 p, 2 fig, 1 tab, 9 ref.

Descriptors: *Anaerobic digestion, *Methane, *Energy conversion, *Biological treatment, *Sludge digestion, Resources, Sludge treatment, Sewage treatment, Costs, Environmental effects, *Waste water treatment.

Identifiers: Methane production.

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Controlled anaerobic digestion as a means of processing organic wastes and producing methane was examined in light of the energy shortage. Comparisons with other biological processes, current research in anaerobic digestion, and cost analyses were presented. Methane production esti-mates and possible uses of sludge-generated methane were considered. Resource recovery concepts related to waste treatment were discussed,

including use of shredding waste as a supplemental fuel, pyrolysis, waterwall incineration, hydrogasification, and methane production. A description of biological processes associated with anaerobic digestion was presented. Parameters controlling methane production, such as tempera-ture, anaerobiosis, pH, nutrients, and toxicity, were listed. Projected costs, advantages, and disadvantages are examined for a 1,000 ton per day bioconversion plant. (Schulz-FIRL) W77-11674

POTENTIAL VALUE OF TREATMENT OF URBAN STORMWATER, New South Wales Univ., Kensington (Australia).

School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-11675

WATER-QUALITY EFFECTS FROM URBAN RUNOFF

Woodward-Clyde Consultants, San Francisco, For primary bibliographic entry see Field 5C. W77-11676

WATER TREATMENT USING OXIDISED

Australian Patent 479,408. Issued January 13, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 46, No 50, p 4873,

Descriptors: *Patents, *Oxidation, *Coagulation, *Aluminum, Water purification, Sludge, Hydrogen ion concentration, Chemicals, *Waste ater treatment Identifiers: Wet air oxidation.

A patent was issued for a waste and water treatment process utilizing oxidized sludge. The process involves coagulation and separation using aluminum compounds. The resultant sludge is subjected to wet air oxidation. The sludge pH is adjusted so that the aqueous mixture resulting from the oxidation treatment will have a pH below 1.5 or above 9.0. This aqueous mixture can be directly re-used for water treatment if its pH is below 1.5 or above 10.5. For pH levels between 1.5 and 10.5, the mixture can be used after the removal of the aluminum compounds by adding acid or alkali. (Collins-FIRL) W77-11677

BIOLOGICAL EFFLUENT TREATMENT PLANT - WITH THREE TANKS ARRANGED FOR REVERSIBLE FLOW, I. R. Kaelin.

German Patent DS 2459-634. Issued April 21, 1977. Derwent German Patents Abstracts, Vol Y, No 17, p D4, June, 1977.

Descriptors: *Patents, *Biological treatment, *Aeration, *Treatment facilities, Activated sludge, Oxygen, Flow, Water purification, Waste treatment. *Waste water treatment.

A patent was issued for a biological effluent treatment plant. The plant consisted of three connected tanks. After the activated sludge concentration in the first tank is reduced to a pre-determined level, the flow is reversed. This allowed the second and third tanks to act as an activated tank. The first tank became a downstream post-clarification tank. Pure oxygen or an oxygen mixture was introduced into the aeration tank by a centrifugal pump impeller below the waste water surface. A flow rate of 30 cm/second was created above the floor of the activated tank. No mechanical sludge removal was necessary for prevention of clogging. (Collins-W77-11678

SMALL-SCALE PLANT FOR MECHANI-CALLY/BIOLOGICALLY PURIFYING WASTE

Netherlands Patent NL 152-516. Issued March 15, 1977. Derwent Netherlands Patents Abstracts, Vol Y, No 1., p D2, May, 1977.

Descriptors: *Patents, *Treatment facilities, *Biological treatment, Water purification, Mechanical equipment, Effluents, Liquid wastes, *Waste water treatment.

A patent was issued for a mechanical-biological waste water purification plant. Only one immer-sion-dripper body was contained in the biological stage. Its worm-like form reduced manufacturing and operating costs. This feature also allowed continuous step-wise cleaning. The biological stage also included a basin with the rotating immersiondripper body. Separate pre- and/or post-purifying tanks may be attached to the unit. (Collins-FIRL) W77-11679

NON-BIODEGRADABLE WASTE WATER TREATMENT - BY WET OXIDN. FOLLOWED BY BIOLOGICAL AERATION IN PRESENCE OF ACTIVE CARBON.

Belgian Patent BE 846-256. Issued March 16, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 12, p D1, April, 1977.

Descriptors: *Patents, *Oxidation, Chemical ox-ygen demand, *Biological treatment, Biomass, Activated carbon, Sewage effluents, Aeration, Odor, Color, *Waste water treatment.

Identifiers: Wet oxidation, Non-biodegradable waste water treatment.

A patent was issued for a non-biodegradable waste water treatment. Effluents were treated by wet oxidation at 150-375 C and 150-4,000 p. s. i. g. This separated the gaseous, solid, and liquid phases and reduced COD by 30-99%. Biological oxidation followed in a tank with a suitable biomass. Powdered activated carbon was added to reduce color and odor while enhancing the oxidation process. Carbon was used up as excess biomass accumulated. The carbon and excess biomass were then moved to a second oxidation stage similar to the first. This regenerated the activated carbon and dispersed excess biomass. The expense of wet oxidation used alone was avoided. Toxic wastes can be biologi-cally treated after wet oxidation. (Collins-FIRL) W77-11680

MECHANICAL SEWAGE SLUDGE COMPOST-ING - IN MIXER WITH RECYCLED BIOGENIC MASS CHARGING REVOLVING HEATED DRUM.

For primary bibliographic entry see Field 5E. W77-11681

AERATION TANK FOR ACTIVATED SLUDGE TREATMENT OF WASTE WATER - IS SMALLER AND REQUIRES LESS POWER FOR A GIVEN TREATMENT CAPACITY. Netherlands Patent NL 7610-431. Issued March 28, 1977. Derwent Netherlands Patents Abstracts,

Vol Y, No 15, p D5, May, 1977.

Descriptors: *Patents, *Aeration, *Equipment, Design, Flow, Activated sludge, Liquid wastes, Treatment facilities, Sewage effluents, *Waste water treatment.
Identifiers: *Aeration tanks.

A patent was issued for an activated sludge treatment aeration tank. The tank was constructed as a horizontal, elongated rectangle. It contained offset immersed flow passages in several compartments formed by transverse partitions. Each division contained an aerating agitator. The liquid passes continuously between an inlet and an outlet each end of the tank. Each compartment had a length/width ratio of 0.59 to 1.70, the preferred

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ratio being 0.60 to 1.00. The flow passage covered 30-80% of the immersed cross-sectional area of its partition. Rotary agitators were used. This design was smaller and required less power for a given capacity than conventional units. (Collins-FIRL) W77-11682

OXIDIZING ORGANIC REFRACTORY CPDS. IN WASTE WATER - BY CONTACT WITH OZONE CONTG. GAS AND SIMULTANEOUS UV IRRADIATION

French Patent FR 2309-480. Issued December 31, 1976. Derwent French Patents Abstracts, Vol Y, No 9, p D5, April, 1977.

Descriptors: *Patents, *Oxidation, *Irradiation, *Organic compounds, Liquid wastes, Waste treatment, Industrial wastes, Municipal wastes, Ul-Carbon dioxide, Carbon, Adsorption, *Waste water treatment, Gases.

A patent was issued for a process to treat organic refractory compounds of biorefractory compounds in a liquid medium. The medium was oxidized with ozone-containing gas and simultaneously subjected to ultraviolet radiation to enhance the process. The treatment was applicable to in-dustrial and municipal water purification. The process was especially useful for wastes that could not be converted to carbon dioxide and water by secondary treatment and carbon adsorption. The combined treatment proved more effective than either individual treatment. (Collins-FIRL) W77-11683

AQ. FERRIC CHLORIDE SOLN. FOR WATER TREATMENT-OBTD. BY NEUTRALISING
AND CHLORINATING PICKLING LIQ.
CONTG. FERROUS CHLORIDE. French Patent FR 2320-911. Issued April 15, 1977.

Descriptors: *Chlorine, *Iron compounds, *Chemical reactions, *Patents, Treatment, Waste treatment, Flocculation, *Waste water treatment. Identifiers: *Ferric chloride, *Ferrous chloride.

A patent has been issued for a process to produce FeC13 in an aqueous solution from a pickling liquid containing FeC12 and HCl. The liquid is first evaporated to a minimum FeC12 concentration of 34.25% by weight and then neutralized in a fluidized bath of iron oxide particles. Next, the mixture undergoes counter-current chlorination at 35-75 C for 73-86% chlorination and then at 40-100 C for 27-14% chlorination. The process is reported to produce a solution containing a minimum of 40% FeCl3, below 0.1% FeCl2, and below 0.1% free HCl. (Schulz-FIRL)

SLUDGE PURGING CONTROL FOR WASTE WATER PURIFICN. PLANT-AUTOMATI-CALLY PREVENTS OVERPURGE WITHOUT ENDANGERING QUALITY OF TREATED WATER.

Netherlands Patent NL 7612-303. Issued May 10, 1977. Derwent Netherlands Patents Abstracts, Vol Y, No 21, p D2, July, 1977.

Descriptors: *Sludge treatment, *Turbidity, Sam-pling, *Automatic control, Equipment, Instrumentation, *Patents, Physical properties, *Waste water treatment.
Identifiers: *Sludge purging control.

patent has been issued for the automatic control of sludge purging from a sludge concentrator. Tur-bidity is measured at two different levels above the sludge bed. When measurements at the upper sampler reach a certain preset value, the sludge purge valve is opened and the lower sampler is ac-tivated. When turbidity at the lower level sampler drops below a preset level, the sludge purge valve is closed and the upper sampler reactivated. A constant level illuminated tank and a photoelectric cell which is attached to a galvanometer are sug-gested for turbidity measurements. This method is reported to minimize excess water loss and errors due to local variations in turbidity above the sludge bed. (Schulz-FIRL)

EFFLUENT PURIFICATION BY BIOLOGICAL ROTARY CONTACTOR--WHICH IS ROTATED BY AIR WHICH DISPLACES LIQUID FROM RADIAL POCKETS.

German Patent DS 2428-910. Issued May 18, 1977. Derwent German Patents Abstracts, Vol Y, No 21, p D3, June, 1977.

Descriptors: *Biological treatment, *Patents, *Packed beds, *Waste water treatment, *Biodegradation, *Water purification, Equipment,

A patent for the biological treatment of waste water using a basin equipped with a circular, rotatable arrangement of biological beds has been issued. The beds are contained in pockets which are a part of a radial contact arrangement. Gases flowing out of a pipeline below the contact ar-rangement are caught in the pockets, causing the contact arrangement to rotate. It is suggested that pockets be placed on the radial outer side of the contact arrangement on non-adjacent circular discs which are part of the contact element arrangement. (Schulz-FIRL) W77-11686

WASTE WATER ORGANIC RESIDUE DETOX-IFICATION-BY TWO STAGE THERMAL TREATMENT AND SEPARATION AT SEPARATION

SPECIFIED TEMP.
Soviet Patent SU-514-773. Issued September 23, 1976. Soviet Inventions Illustrated, Vol Y, No 22,

Descriptors: *Separation techniques, *Organic wastes, *Waste water treatment, *Heat treatment, Waste treatment, Chemical oxygen demand,

A patent has been issued for a more economical method for the detoxification of organic wastes. Waste water containing a high concentration of or-ganic substances is heated to 120-130C and separated into a highly concentrated precipitate and a weakly concentrated filtrate which requires no further treatment. Maintenance of proper temperature is important to insure good separability and minimum contamination of the filtrate. In a test using excess active sediment with W(p) of 97.5% and COD of 2.2 kg/cu m, the desc 27... and COD of 2.2 kg/cu m, the described method produced a precipitate with a COD of 4-6 kg/cu m. After heating to 180-200C, separating, and drying, the volume of the precipitate was 0.05 cu m and the filtrate volume was 0.45 cu m, with a COD of 21 kg/cu m. Energy consumption for the process was 290,000 kcal of heat. (Schulz-FIRL) W77-11687

EFFLUENT WATERS CLEANING AUTOMATIC CONTROL-USED FOR DOMESTIC AND IN-DUSTRIAL WASTES AND BASED ON COLOUR MINITOR TO CONTROL COAGULANT

Soviet Patent SU-514-774. Issued September 22, 1976. Soviet Inventions Illustrated, Vol Y, No 22, p D2, July, 1977

Descriptors: *Coagulation, *Effluents, *Color, *Automatic control, *Instrumentation, *Patents, Remote control, Automation, Equipment, Waste Identifiers: Oxygen-based buffer meter.

A patent has been issued for a system designed to control the coagulation treatment of domestic and industrial effluents in a reaction vessel. The system is comprised of a coagulant dispenser consystem is comprised of a coagulant unspenser con-trolled by a buffer meter and a color meter. The amount of coagulant initially added to the reaction vessel is determined by the oxygen-base buffer meter, which dispenses a dosage based on alkalini-ty of incoming effluents. After the treated effluent leaves the reaction vessel its color is monitored if leaves the reaction vessel, its color is monitored. If the color of the effluent exceeds preset limits, a signal generated by the color meter adjusts the dosage added by the coagulant dispenser. (Schulz-FIRL) W77-11688

LIQ. E.G. AQ. EFFLUENT TREATMENT WITH OZONE-EMPLOYING USED OZONE AND THEN FRESH OZONE, BOTH PRESSURIZED. French Patent FR 2321-299. Issued April 22, 1977. Derwent French Patents Abstracts, Vol Y, No 21, p D6, July, 1977.

Descriptors: *Oxidation, *Ozone, *Waste water treatment, *Disinfection, *Liquid wastes, Treatment, Waste treatment, Organic compounds, Gases, *Patents.
Identifiers: *Ozonation.

A patent for the oxidation of waste water by exposure to pressurized ozone has been issued. Pressurized gas containing a proportion of residual ozone is used to pretreat the effluent stream. In the second stage of the treatment process, freshly made ozone at a concentration of at least 10 weight percent of the carrier gas and at higher pressures (0.07-2.1 kg/sq cm) than in the initial phase is added to the effluent stream. The ozone used in the second stage can be recycled for use in pretreatment of the next batch of effluent. Pretreatment is reported to increase the rate and efficiency of ozonation in the second stage. This process can be used for the disinfection of waste waters. (Sci W77-11689 vaters. (Schulz-FIRL)

BIOLOGICAL CONTROL OF WATER POLLU-TION.

Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design. For primary bibliographic entry see Field 5G. W77-11690

EXPERIMENTAL USE OF EMERGENT VEGETATION FOR THE BIOLOGICAL TREATMENT OF MUNICIPAL WASTEWATER

IN WISCONSIN, Wisconsin Univ., Oshkosh. Dept. of Biology. For primary bibliographic entry see Field 5G. W77-11691

RENOVATION OF MUNICIPAL WASTE-WATER FOR GROUNDWATER RECHARGE BY THE LIVING FILTER METHOD, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. For primary bibliographic entry see Field 5G. W77-11692

THE POTENTIAL OF SUBMERSED VASCULAR PLANTS FOR RECLAMATION OF WASTE-WATER IN TEMPERATE ZONE PONDS. Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5G. W77-11693

MACROPHYTES AND WATER PURIFICA-

TION, Max-Planck-Gesellschaft fuer Zuechtung sforshung, Krefeld (West Germany). Limnological Research Group.
For primary bibliographic entry see Field 5G.
W77-11694

THE PURIFICATION OF WASTEWATER WITH THE AID OF RUSH OR REED PONDS, Federal Commission for the Ijsselmeerpolders, The Hague (Nederlands). For primary bibliographic entry see Field 5G. W77-11695

THERMAL CONDITIONING WITH AIR. Water Services, Vol 81, No 976, p 341-342, 344, June, 1977. 1 fig.

Descriptors: Equipment, *Dewatering, *Heat exchangers, *Sludge treatment, *Treatment facilities, *Oxidation, Activated sludge, Sludge disposal, Incineration, Municipal wastes, Industrial wastes, Waste water treatment.

High pressure heating of sludge has been used to facilitate dewatering. The Zimpro Thermal Conditioning with Air unit, which combines aeration with the heating process, also reduces odors by oxidation and improves heat exchange. A single stream Zimpro unit being installed at Worleston, Crewe, England, will thermally condition a mixture of waterworks sludge, digested primary sludge, and surplus activated sludge at a rate of 16.4 cu m/hr. Additional provisions will include dewatering by filter presses and autothermic multiple hearth incineration with waste heat recovery. A three stream plant being supplied to the Anglian Water Authority is planned to condition a mixture of primary, surplus activated, and humus sludge. Implementation of the Zimpro unit is expected to reduce the quantity of dewatered sludge for ultimate disposal as well as aid in the processing of industrial wastes. (Schulz-FIRL)

AIR BLOWERS FOR SEWAGE AND WATER TREATMENT.

For primary bibliographic entry see Field 5F. W77-11697

THE PRESSURE DRUM FILTER FOR SLUDGE DEWATERING.

Water Services, Vol 81, No 976, p 348, June, 1977.

Descriptors: Equipment, *Sludge treatment, *Dewatering, *Filters, Sludge, Flocculation, Stabilization, *Waste water treatment. Identifiers: *Pressure drum filter. Belt filter.

Stamford, Connecticut has purchased a British designed and manufactured Wickham pressure drum filter from the Wickham Filtration Engineering Division. It is estimated that using the new belt filter for sludge dewatering instead of existing equipment will save \$40,000 to \$90,000 for Stamford. The stainless steel filter belt is automatically adjustable for variations in sludge thickness. Raw feed sludge and dilute electrolyte pass from an inline mixer to a sludge-chemical contact zone to produce large undamaged flocs. Application of light pressure stabilizes sludge after it undergoes gravity filtration. Stabilized sludge is then compressed by a filter-mesh-covered pressure drum and carried out on a conveyer belt. (Schulz-FIRL) W77-11089

BASIC UNITS MANUFACTURED FOR SLUDGE TREATMENT. Water Services, Vol 81, No 976, p 341, June, 1977.

of

Descriptors: *Dewatering, *Equipment, *Sludge treatment, *Waste water treatment, *Activated sludge, Incineration, Filtration, Waste treatment.

A sludge thickening device, analogous to a picket fence, has been manufactured by Esmil/Envirotech Ltd., a British firm headquartered in Huntingdon, Cambridgeshire, England. Sludge is homogenized by a series of arms or pickets and raked to a central discharge hopper. The Eimco Dissolved Air Flotator produces

thicker waste activated sludges than conventional gravity thickening and yields solids contents of 3 to 5 percent. Reported advantages of the flotator include smaller space required for operation, thick sludge production, and high oxygen content and low suspended solids in the effluent. The EimcoBelt continuous belt filter provides an alternate method for sludge dewatering at low cost for a wide variety of sludges, including raw primary, waste activated, thermally processed, and chemically/physically treated sludges. Operating at high vacuum, the filter discharges the dewatered sludge by passage of the filter cloth over a roller. Water jets applied to both sides of the filter cloth before it returns to the drum are designed to minimize blinding. Another mode of sludge treatment, the BSP furnace, is suited for the autothermic combustion of sludges with high moisture content. The multichamber zone effect, produced by a series of superimposed hearths in a refractory-lined cylinder shell, eliminates the need for pre-drying of feed and provides multi-stage process control. (Schulz-FIRL).

USING WETLANDS FOR WASTEWATER TREATMENT.

Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1581, July, 1977.

Descriptors: *Wetlands, *Swamps, *Marshes, *Waste water treatment, *Nutrients, Cycling nutrients, Freshwater marshes, Water purification, Michigan, Florida, Water Pollution Control Federation.

The possible use of wetlands in Michigan and Florida for final treatment of municipal waste water has been considered. At a trial site in Florida, waste water is pumped into cypress ponds where nutrients are absorbed by vegetation. Costs for this method of treatment are approximately 50 percent less than for treatment by a conventional plant. At a trial site in Michigan, waste water is pumped into a peat marsh for the removal of nutrients. (Schulz-FIRL)

PHYSICAL-CHEMICAL TREATMENT SYSTEM FOR SEWAGE.

Water Services, Vol. 81, No. 976, p 373, June, 1977. 1 fig.

Descriptors: *Municipal wastes, *Waste water treatment, *Activated carbon, *Chlorination, *Flocculation, Design, Sewage treatment, Costs.

Systems for the physical and chemical treatment of non-industrial sewage have been adapted by Japan's Ministry of Construction. Designed, manufactured, and marketed by the Nippon Kokan KK, the systems have standard capacities of 200,000, 400,000, and 600,000 cubic meters/day. In the system, activated carbon is used to remove organic wastes before flocculation by the addition of sulfuric acid and polymer. The remaining waste water is chlorinated and passed through an up-flow filter before it is discharged. At the time of discharge BOD and COD are at concentrations of less than 10 parts per million. While operating costs are slightly higher than those for a conventional activated sludge system, construction costs are about two-thirds lower. (Schulz-FIRL)

OXYGEN INJECTION BLOWS NEW LIFE INTO DROUGHT HIT SEWAGE TREATMENT WORKS, D. Martin.

Process Engineering, p 11, June, 1977.

Descriptors: *Injection, *Oxygen requirements, *Dissolved oxygen analyzers, *Activated sludge, Aerobic conditions, Sludge treatment, Aerobic treatment, Sewage sludge, Waste water treatment. Identifiers: *Oxygen injection system.

A BOC system has been used by the Wessex Water Authority in England to supplement oxygen supplies and to cope with fluctuating demands on the Bournemouth sewage treatment system. Electronic sensors in the activated sludge tank monitor dissolved oxygen levels and trigger a high-pressure oxygen injection system when levels drop below preset values. The two Vitox systems in use can provide three and four tons of oxygen per day, respectively. Oxygen is stored in vacuum-insulated vessels which are filled by road tankers an eccessary. The system proved useful as an alternative to construction of new facilities during a recent water shortage, when reduced water consumption resulted in more concentrated influent entering the system. (Schulz-FIRL)

PALO ALTO SEES GOLDEN GLINT IN SLUDGE.

The American City and County, Vol. 92, No. 7, p 23, July, 1977.

Descriptors: *Metals, *Gold, *Silver, *Reclamation, *Sludge disposal, Electronics, Industrial wastes, Chemical wastes, Sludge treatment, Separation techniques, Costs, Heavy metals, California, Waste treatment.

Precious metals from wastes from area electronics industries have been discovered in sludge ash from the Palo Alto sewage treatment plant. Various methods to recover the estimated ounce of gold and 15 ounces of silver per ton of sludge ash were considered. Although sewage treatment does concentrate metals in sludge, small particle sizes and the lack of a smelter in the immediate vicinity inhibit the use of magnetic separation and smelting in the recovery of these metals. Options being considered include sale of the ash to an outside processing facility which would be operated on a profit-sharing basis by a private contractor and the city of Palo Alto. Although costs and environment ali impact of an on-site facility have not yet been assessed, the use of a mining industry-related process for cyanide extraction of metals is being considered for Palo Alto sludge by the World Resouces Company. (Schulz-FIRL)

PERIPHERAL MIXING TURNS SLUDGE INTO FUEL GAS.

The American City and County, Vol. 92, No. 7, p 58-59, July, 1977. 1 fig.

Descriptors: *Digestion tanks, *Sludge treatment, *Energy, *Convection, Circulation, *Mixing, Treatment facilities, Model studies, Design data, Municipal wastes, Energy conversion, Waste water treatment.

Identifiers: Peripheral mixing.

The addition of sludge around the sidewall of a digester as well as into its center is reported to have increased sludge handling capability and energy savings for Dayton, Ohio. Pilot studies of a multi-point injection system allowing for distribution of sludge to 10 points at the periphery of a digester at Dayton's sewage treatment plant suggest that the system may increase gas production in digesters by 13-25%. This is attributed to the formation of a larger active zone by peripheral mixing. The larger active zone may also be useful in dampening problematic effects caused by variations in pH, temperature, and sludge solids within digesters, leading to greater gas production and volatile solids reduction. Design suggestions include the placement of five inlet pipes at a single level around the perimeter, and the placement of a vertical pipe in the center of the digester tank to circulate warmed sludge over the scum blanket at the top of the digester. While conventional mixing methods such as mechanical mixing and gas induction require energy, peripheral sludge injection produces thermal convection currents for mixing,

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with energy consumption limited to that used to in-ject the sludge into the digester. Gas production from the digesters at the Dayton plant is more than sufficient to adequately heat the plant's buildings and digesters. (Schulz-FIRL) W77-11704

CONTRACTS UNDERWAY COMPLETE SOUTH BAY AREA WATER TREATMENT PLANT. Western Construction, p 40, 42, July, 1977.

Descriptors: *Tertiary sludge, *Nitrification, *Filtration, Biological *Tertiary treatment, *Activated trification, *Treatment facilities, Ammonia. treatment, Nitrogen compounds, California, Construction, Waste water treatment Identifiers: Multi-media filtration.

Advanced waste treatment facilities are being constructed for the San Jose/Santa Clara Pollution Control Plant by four California firms jointly operating as the Waste Water Construction Company. Two contracts totalling \$58,692,500 were awarded on January 13, 1976 for the construction of nitrification facilities and of multi-media type tertiary filter facilities. The nitrification facilities will include an activated sludge-type waste water treatment plant for the nitrification of ammonia in effluent from the existing secondary treatment facilities. A two-stage biological system will be formed by the addition of the new sludge treat-ment plant to the existing facilities, which will comprise the first stage used to remove org carbon. Specialized bacteria and aerobic nitrifiers will be used for biological nitrification in the econd stage of treatment by the new facilities. The tertiary filter facilities, which will be used to filter effluent from the ammonia nitrification facilities, will include gravity filters, chlorine contact basins, a filter service building, and a paint shop. Additional filtration processes will be pro-vided for removal of BOD, suspended solids, voided for removal of BOD, suspended soluts, coliform, and floatables. Federal and state funds will provide up to 87.5% of the costs of the \$66,500,000 project which is scheduled for completion in August 1978. (Schulz-FIRL) W77-11705

ADAPTATION TO NITRIFICATION OF AC-TIVATED SLUDGE SYSTEMS TREATING HIGHLY NITROGENOUS WATERS, Ghent Rijksuniversiteit (Belgium).

W. Verstraete, H. Vanstaen, and J. P. Voets. Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1604-1608, July, 1977. 4 fig, 2 tab, 8

Descriptors: *Nitrification, *Activated sludge, *Nitrogen compounds, *Farm wastes, Bacteria *Waste water treatment, Water Pollution Control Federation, Nitrogen fixing bacteria, Model stu-dies, Ammonification, Sludge treatment, Control, Operations, Waste treatment.
Identifiers: Nitrobacteria, Nitrification tolerance.

Nitrification processes occurring in activated sludge plants treating highly nitrogenous waste water can be unpredictable during the start-up of the plant. For this reason, an investigation was in-itiated to determine whether a start-up procedure could be designed on the basis of a nitrificationtolerance graph. The validity of the graph and the required time for establishing a maximum nitrifying community were then studied. Laboratory studies using various nitrogen loading rates indicate that an N-loading of about 1.2 mg/liter per day is the optimal start-up rate. Gradual auto-acidification of the mixed liquor is suggested during the adaptation phase to insure low NH3-N levels. Since nitrifying bacteria are sensitive to environmental changes, plant start-up for specific waste waters is suggested. A nitrification-tolerance graph was considered as a useful guideline for nitrification process control. (Schulz-FIRL) W77-11706 EXTENSIONS TO GREAT BILLING STW

Water Services, Vol. 81, No. 976, p 329-333, June, 1977. 1 fig.

Descriptors: *Biological treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, Filtration, Sewage treatment, Settling basins, Municipal wastes, Waste water treatment. Identifiers: High-rate filtration.

A two-stage filtration system using high rate filters followed by biological filters has been adapted for the Great Billing Sewage Treatment Works in Northampton, England. The works will receive sewage discharges through three gravity sewers of 1500 mm diameter and will treat 318 liters per capita per day. Processing of settled sludge is di-vided between the new biological filtration plant nd the existing activated sludge plant built in 1953. Sludge is mechanically screen raked, and di-vided equally by five flumes which each control flow to a primary settling tank. Sludge is lifted by screw pumps to either the activated sludge plant or the new biological treatment plant. Sludge processed at the new plant undergoes high rate filtration which reduces the organic load by 80 per-cent. Screw pumps then lift the sludge to be divided equally among six biological filters, where filtration at a slower rate using smaller filtering media removes the remaining organic material. Effluent, collected in channels at the base of the filters, then flows to humus chambers where solid matter is settled out before discharge of the final effluent into the River Nene. The sludge removal system at Great Billings has been designed to offer greater flexibility for sludge routing by providing alternate methods by which sludge can be removed from primary settling tanks and fed to the storage tanks. Because treated sludge retains a significant amount of nitrogen and phosphorus, it is used as a soil conditioner for 200 hectares of farmland. (Schulz-FIRL) W77-11707

EVALUATION OF RESIDUAL CHLORINE CONTROL SYSTEMS,
Fischer and Porter Co., Warminster, Pa

For primary bibliographic entry see Field 5F. W77-11708

PROCESSING TO DIGESTIBILITY AND ENERGY PRODUCTION, Regional Wastewater Solids Management Program, Whittier, Calif. Laloma Project. For primary bibliographic entry see Field 5E. W77-11709

SLUDGE HANDLING. For primary bibliographic entry see Field 5E. W77-11710

THE WASTE WATER TREATMENT BERG-STRASSE - POSSIBILITIES AND SELECTION OF THE SLUDGE KLAERANLAGE TREATMENT BERGSTRASSE MOEGLICHKEITEN MOEGLICHKEITEN UND WAHL SCHLAMMBEHANDLUNGS-SYSTEMS), DES Gesellschaft fuer Klaeranlagen und Wasserversorgung, Mannheim (West Germany). W. Kaufhold.

Wasserwirtschaft, Vol. 67, No. 6, p 162-168, 1977. 6 fig, 2 tab, 3 ref.

Descriptors: *Dewatering, *Sludge treatment, *Sludge digestion, *Feasibility studies, *Cost comparisons, Waste water treatment, Floccula-tion, Incineration, Sludge disposal, Municipal wastes, Chemical precipitation, Filtration, Biological treatment Identifiers: Thermal conditioning

A centralized waste water treatment facility is being planned by the Bergstrasse Regional Water

Authority in West Germany for the processing of wastes from 9 cities and 25 townships in the Hessen and Baden-Wurtemberg areas. Sludge treatment by thermal conditioning and dewatering in chambers has been chosen for use in the processing of the 20.68 tons/day of raw sewage expected to enter the facility. Other alternatives sludge treatment which were investigated for possible use were: incineration; chemical treatment and flocculation with FeCl2 and lime or with polyelectrolytes; and anaerobic digestion. Cost estimates for construction, operation, and maintenance were prepared for the various alternatives. (Schulz-FIRL) W77-11711

HYGIENIZATION OF SEWAGE SLUDGE BY . ELECTRON IRRADIATION, For primary bibliographic entry see Field 5E. W77-11712

LAGOONS AND OXIDATION PONDS. (LITERATURE REVIEW), Black and Veatch, Dallas, Tex. W. J. O'Brien. Journal Water Pollution Control Federation, Vol. 49, No. 6, June 1977, p 1016-1019. 53 ref.

Descriptors: *Lagoons, *Ponds, *Oxidation lagoons, *Aerated lagoons, *Sewage lagoons, Photosynthesis, Nutrients, Heavy metals, Infiltration, Microorganisms, Bacteria, Effluents, Waste water treatment, Water Pollution Control Federa-tion, Bibliographies.

A review of literature concerning various aspects of lagoons and oxidation ponds is presented. Published proceedings of a 1975 conference on lagoons and oxidation ponds are cited. Design considerations discussed were mixing, flow patterns, aeration, and cell number. Physiocochemical parameters mentioned include pH, rates of methane fermentation and volatile acid production, nutrient strength, and concentrations of ammonia, algae, DO, and sulfide. Studies on detention time and pond depth are described. The use of plants and fish to upgrade effluent, and the use of spray irrigation of oxidation pond effluent, are discussed. Soil characteristics are considered with respect to heavy metal concentrations, infiltration rate, seismic sounding, and electrical resistivity. (Schulz-FIRL) W77-11714

TREATMENT OF ORGANIC WASTE WATER BY TOWER TYPE PACKED BIOFILTER (JUTENTO SHIKI ROSHO HO NI OKERU KAIBUNSHIKI SHORI NO JOKA SOKUDO), Kyushu Univ., Fukuoka (Japan). Dept. of Food

Science and Technology.
K. Yoshihara, S. Udo, M. Sanbuichi, Y. Fujio, and Hakko Kogaku, Vol. 55, No. 3, p 129-133, 1977. 7

fig, 10 ref. Descriptors: *Chemical oxygen demand, *Filters, *Biological treatment, *Organic wastes, Waste water treatment, Filtration, Laboratory tests,

Flow rates Identifiers: *Biological filters, Tower-type biologi-

Laboratory studies on a biological method for the treatment cf organic wastes are described. Operational time, recirculation, and batch volume were considered during the examination of COD removal by a tower-type biological filter which had been filled with 400 25-mm glass spheres. Aerobic conditions and a temperature of 22 C were maintained in the 100 mm filter throughout the experiments. Results indicated that, at a given batch volume and recirculation flow rate, COD removal was directly related to operational time. COD removal was observed to increase rapidly with recirculation rate up to a rate of 111 cu m/sq m/day and approached a maximum value at 146 cu m/sq m/day. Since these effects were attributed to the activity of the biofilm, it was suggested that recir-culation flow rates be chosen for maximum use of the biological film without loss of adhesion of the film to the media. In pilot studies with batch volumes of 0.002-0.012 cu m, COD removal by the filter was observed at 3 to 4 kg COD/cu m/day for recirculation flow rates between 110 and 238 cu m/sq m/day. (Schulz-FIRL) W77-11715

HAYLE'S LONG WAIT FOR ITS SEWAGE SCHEME IS OVER, J. Pullin.

Surveyor, Vol. 150, No. 4439, p 10-11, July, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, *Sludge disposal, *Municipal wastes, Filtration, Biological treatment, Dewatering, Settling basins, Waste water treatment.

A new sewage treatment facility in the Hayle area of West Cornwall, England is described. Construction of the new facility began in 1975, 20 years after its initial conception. The treatment facility, designed to accommodate a population of 50,000, is intended to replace existing facilities which discharged directly into the Hayle Estuary which empties into St. Ives Bay. Municipal wastes, fluctuating with the area's tourist industry, and wastes from the St. Erth Creamery will be processed. Treatment facilities include primary sedimentation, media filtration, secondary biological filters, coagulation, and dewatering by gravity filtration. A landfill is intended for sludge disposal. Plans for regionalization of sewage treatment are being considered. (Schulz-FIRL) W77-11716

TREATMENT OF WATER AND EFFLUENT BY

Journal of the Institution of Engineers (India), Vol. 26, No. 9, p 30, March, 1977.

Descriptors: *Flotation, *Aeration, *Suspended solids, *Waste water treatment, Municipal wastes, Industrial wastes, Sludge treatment, Equipment, Sewage treatment, Hydraulic equipment, Floccu-

Identifiers: Air flotation.

An air flotation process in which micro-bubbles are used to clarify waste water and remove impuri-ties is described. A recirculating hydraulic pump is used to produce water which is saturated with air or some other gas. The system is reported to remove from 90 to 99 percent of suspended solids with low flocculant consumption. Use of the aystem is suggested for treatment of municipal wastes and a wide variety of industrial wastes. Other advantages of the system include low energy consumption (50 to 150 Wh/sq m), compact size, immediate start-up, resistance to corrosion and clogging, and automatic operation and installation. (Schulz-FIRL) W77-11717 system is suggested for treatment of municipal

NEW DEVELOPMENT.

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Effluent and Water Treatment Journal, Vol. 17, No. 6, p 275, June, 1977.

Descriptors: *Filtration, *Screens, *Equipment, *Tertiary treatment, *Water treatment, Suspended solids, Biochemical oxygen demand, Turbidity, Waste water treatment. Identifiers: *Rotary drum microscreens.

A series of rotary drum microscreens produced by Paterson Candy International Limited is described. The microscreens are designed for sewage and water treatment and are used in the treatment of storm water overflows, final effluent polishing, BOD and turbidity removal, and algae and plankton removal. Water flows in through the

open end of a horizontally rotating drum which is covered with panels of filter mesh. Filtered water flows out of the drum radially, leaving suspended solids inside the drum. The individually replaceable filter mesh panels contain a polypropylene support grid at 20 mm square intervals and can be used with any commercially available media, including stainless steel mesh and polyester fabric. Continuous spray, time-sequenced and headloss menitoring are contained in backwash spray systems for filter cleaning and removal of retained solids. (Schulz-FIRL) W77-11718

BRISBANE COUNCIL'S FIRST IN AUSTRALIA AT SEWERAGE TREATMENT PLANT.

Engineers Australia, Vol. 49, No. 16, p 26, June,

Descriptors: *Treatment facilities, *Drying, *Sludge treatment, *Aluminum alloys, treatment, *Equipment, Separation techniques, Design data, Australia, Construction materials, Waste water treatment.

Identifiers: Sludge drying, Aluminum gantries.

Aluminum gantries furnished by Highgate Engineers are being used at the Luggage Point sewage treatment plant in Brisbane, Australia. Advantages to the use of the lightweight aluminum gantries include resistance to corrosion by the abrasive atmosphere of Moreton Bay, and reduced construction requirements for the load-bearing walls. The gantries will service four 4.4 hectare sludge drying beds, removing dried sludge, distributing sludge from digestion tanks to drying beds, and placing sand media in the beds. The first stage of the Luggage Point treatment facility is designed for sewage treatment for a population of 500,000 at a cost of \$30 million; the second stage will be a duplication of the first. (Schulz-FIRL) W77-11719

GRANULAR ACTIVATED CARBON IN WATER TREATMENT,

Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

J. J. McCreary, and V. L. Snoevink.

Journal of the American Water Works Association, Vol. 69, No. 8, p 437-444, August, 1977. 6 fig,

Descriptors: *Activated carbon, *Adsorption, *Odor, *Water quality, *Color, Organic compounds, Organic wastes, Model studies, Pilot plants, Organic matter, Water properties, Water treatment, Municipal wastes, Industrial wastes,

Identifiers: Granular activated carbon

The use of granular activated carbon filtration in water treatment is reviewed. Activated carbon treatment is normally used to reduce odor and color derived from organics which may be added to water by industrial and municipal discharges, agricultural runoff and other nonpoint sources, decaying vegetation, and reaction of water-treatment chemicals such as chlorine with organic aqueous matter. The efficiency of granular ac-tivated carbon treatment for removal of biologically derived odor and carbon chloroform extract, odors of industrial origin, sulfide odor, pesticides, hydrocarbons, and haloforms is discussed. Various carbon types are examined for relative effi-ciencies of total organic matter removal. The presence of organic chlorine is considered for carbon choice. Pretreatment effects on the adsorption process resulting from clarification, ozonation, chlorination, softening, and manganese removal are described. Studies on competitive adsorption are referenced for bisolute systems and for single compounds in the presence of natural orga matter. Monitoring procedures, bed design, pilot studies, and biological activity in granular ac-tivated carbon beds are examined. (Schulz-FIRL) VISCOSITY EFFECTS OF SLUDGE. For primary bibliographic entry see Field 5E. W77-11722

HIGH RATE FILTER AT RUGBY. Water and Waste Treatment, Vol. 20, No. 6, p 14,

Descriptors: *Filters, *Packed beds, *Filtration, *Sewage treatment, Biochemical oxygen demand, Effluents, Treatment facilities, Waste water treat-

Identifiers: *High rate filters, Plastic filter media.

Rugby Water Reclamation Works in England has begun using a high rate filter manufactured by Norton Chemicals Process Products Limited, Stoke-on-Trent, in the treatment of a daily waste water flow of 15,000 cu m/d. A four-arm stainless steel trough-type distributor which is supported on a 1.2 m heavy-duty bearing is used to conduct waste water into the filter. The filter itself is 30 meters in diameter and filled with 200 cu m of plastic media. Effluent quality was increased from 33-39 mg/liter BOD and suspended solids to 19-23 mg/liter BOD and suspended solids with the use of the high rate filter. BOD of settled influent was reduced by 85% to 30 mg/liter. (Schulz-FIRL) W77-11723

REDUCTION OF NON-IONIC DÉTERGENTS IN CONNECTION WITH BOTTOM TO THE CONTAMINATION OF THE CONNECTION WITH BASIC INDICATORS OF ZANIECZYSZCZEN

SCIEKOW MIEJSKICH), Medical Academy, Gdansk (Poland). Inst. of Hy-

J. Pastor-Rodziwanowska. Gaz, Woda i Technika Sanitarna, Vol. 51, No. 1, p 21-22, January, 1977. 2 tab, 13 ref.

Descriptors: *Detergents, *Biological treatment, *Colorimetry, *Reduction, *Sewage treatment, In-dustrial wastes, Municipal wastes, Effluents, Suspended solids, Flow, *Waste water treatment.

The reduction of non-ionic detergents in connection with the reduction of basic sewage pollutants in a purification plant of the mechanical-biological type was evaluated. The material canadata taken from sewage samples entering and leaving the purification plant. Seventeen tests were performed over a period of three months. To determine the level of non-ionic detergent ranging from 1-25 mg/liter, a colorimetric method using phosphorotungstic acid and a barium compound was employed. The detergents were precipitated from the solution in the form of a complex compound. The precipitate was separated and dis-solved in concentrated H2S04. A hydrochinone solution was added, producing red coloration. Its degree of intensity was defined by the wavelength lambda-500 mm. It was found that the concentration of non-ionic detergents was reduced by a an 31.6%. Average level of non-ionic deterger in the sewage leaving the purification plant was 3.7 mg/liter. Reduction of BOD5 and suspended mg/liter. Reduction of BODO and suspenses matter did not reach the intended level because the sewage flow was always higher (average 25%) than the level designed. It was concluded that a positive correlation exists between the quantity of incoming non-ionic detergents and the extent of their reduction. Reduction was adversely affected by an increased sewage flow and high level of suspended material at the entrance of the purification plant. An increased sewage flow was ascertained to have a negative effect on reduction of all compone including non-ionic detergents. (Tallert-FIRL) W77-11724

EXPERIENCE WITH THE BACTERIOLOGI-CAL CONTROL OF WASTE WATER PURIFICATION (A SZENNYVIZTISZTAS BAK-

Group 5D—Waste Treatment Processes

TERIOLOGIAI ELLENORZESENEK TAPASZ-TALATAI),

L. Nemedi Budapesti Kozegeszsegugy, No. 4, p 113-120, 1976 8 tab 14 ref.

Descriptors: *Salmonella, *Clostridium, *Coliforms, *Bacteria, *Waste water treatment, Municipal wastes.

The effects of different methods of municipal waste water treatment in bacteriological chara teristics were studied. Bacteria growing at 20C on gelatin, at 37C on agar, Clostridia, coliform bacteria, Streptococcus faecalis, Pseudomonas aeruginosa, and Salmonella were determined. Waste water treatment by means of activated sludge and percolation bodies caused no considerable improvement in the bacteria counts. Settlers, oxidation ditches, and the slow sand filtration method proved to be efficient in the reduction of the bacteria counts. Regardless of the treatment method, the reduction was most marked for bacteria growing at 20 and 37C, P. aeruginosa, and smallest for Clostridium and Salmonella. Salmonella, coliform bacteria, and P. aeruginosa proved to be highly sensitive to gamma-irradiation, while Clostridium and S. facalis were resistant. (Takacs-FIRL) W77-11725

GUIDELINES FOR THE OUICK EVALUATION OF THE SEWAGE PURIFICATION PROCESS WITH ACTIVATED SLUDGE (PRZEWODNIK DLA SZYBKIEJ OCENY PRZEBIEGU OCZYSZCZANIA SCIEKOW OSADEM CZYNNYM. ORGANIZMY CZESC. Ш. RZADZIEJ SPOTYKANE),

Institute for Environmental Management, Warsaw (Poland)

H. Klimowicz.

Gaz, Woda i Technika Sanitarna, Vol 51, No 3, p 73-77, March, 1977. 1 tab, 23 ref.

Descriptors: *Microorganisms, *Bioindicators, *Activated sludge, *Water purification, *Sewage, Biological treatment, Analysis, Water quality standards, Sewage treatment. Identifiers: Microfauna.

Guidelines for the identification of microfauna as bio-indicators for the purification process with activated sludge were presented. The microorganisms infusoria, rotifers, flagellates, rhizopods, turbellaria, gastrotriacha, nematodes, oli gochaeta, etc. They appeared at different stages of the purification process and varied in number. Flagellates were indicative of poor progress in an inadequately working purification plant or its low purification level designed beforehand. Some species were rarely encountered and only in small numbers. Other species turned up in large numbers in poorly running plants, but decreased numerically extent that the plant operation improved. Due to the fact that 1 liter of activated sludge averaged 27,909,000 flagellates, 15,379,000 rhizopods, 27,000 gastrotrichae, 129,000 nematodes, and 29,000 oligochaetae (levels considered to be low in activated sludge, but much higher than in rivers and lakes), the role of this microfauna in the sewage purification process has to be regarded as substantial. Determinations of species and num-bers present in samples would be excellent bioindicators to assess the level of sewage purification. (Tallert-FIRL) W77-11726

EFFECTS OF NITRIFICATION IN THE AC-TIVATED SLUDGE PROCESS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and

M. E. Degyansky, and J. H. Sherrard. Water and Sewage Works, Vol 124, No 6, p 94-96, June, 1977. 3 fig, 6 tab, 7 ref. Descriptors: *Nitrogen, *Nitrification, *Biological treatment, *Activated sludge, Waste water treatment, Biological oxygen demand, Oxygen, Alkalinity, Oxidation, Eutrophication, Water pollution, Water quality standards.

The removal of waste water nitrogen, or its conversion to its most oxidized form, is frequently desirable. The process of nitrification, the biologi cally mediated conversion of NH4+-N to NO3 N, is considered in terms of oxygen demand and depletion of alkalinity. As a model, an example situation is used in which a completely mixed activated sludge process receives waste water with a variable BOD:NH4+-N ratio and a variable mean cell residence time. The oxygen requirement for the nitrification process is demonstrated to be not the constant value previously believed, but rather a value dependent on the BOD:NH4+-N ratio and on mean cell residence time. Likewise, the alkalinity destroyed is variable. These findings must be considered in designing biological waste treat-ment processes. (Pfeifer-FIRL) W77-11727

MICROBIOLOGY OF WASTE TREATMENT,

(LITERATURE REVIEW), Pennsylvania State Univ., University Park. R. F. Unz.

Journal Water Pollution Control Federation, Vol 49, No 6, p 1255-1268, June, 1977. 130 ref.

Descriptors: *Microbiology, *Microbial degrada-tion, *Activated sludge, *Viruses, *Bacteria, *Disinfection, Diseases, Environmental sanita-tion, Chlorination, Anaerobic digestion, Irrigation practices, Water reuse, Fertilizers, Agriculture, Metals, Nutrients, Sewage sludge, Land reclama-tion, Sludge disposal, Waste water disposal, Waste water treatment, Analytical techniques, *Bibliographies.

A literature review of various aspects of microbial contamination by waste water treatment practices has included a survey of possible sources, types, and removal procedures. Among the methods of disinfection described were chlorination and ultraviolet irradiation. Seasonal variations in viral content of raw waste water and reduction methods are also described. A survey of studies on the roles that nutrient levels, metal ions, and toxic conditions play in the destruction and inhibition of bacteria is presented. Aerobic and anaerobic biodegradation are considered under a wide variety of conditions. Possible implications of contamination by bacteria and viruses contained in sludge and waste water used for agricultural pur-poses, such as irrigation, are outlined. (Schulz-FIRL) W77-11729

DISINFECTION, (LITERATURE REVIEW), Georgia Inst. of Tech. Atlanta.

A. W. Hoadley, and J. P. Gould.

Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1067-1074, June, 1977. 65 ref.

*Disinfection. *Chlorination. Descriptors: *Ozone, *Irradiation, *Bacteria, Viruses, Municipal wastes, Sewage treatment, Sludge treatment, Waste water treatment, Microorganisms, Environmental sanitation, Water Pollution Control Federation, *Bibliographies.

A literature review on disinfection is presented. Topics covered include the chemistry of chlorinaon and related microbiological effe effects of harmful products formed during the process of chlorination of organic compounds are discussed. Biological factors affecting disinfec-tion, including resistance to chlorination and to aggregation, are cited. Ozonation and irradiation of waste water effluents are described as possible al-ternatives to chlorination. Inactivation of viruses present in sludge by gamma irradiation, disinfection, ozonation, and heating are reported. (SchulzW77-11730

BEHAVIOR OF BENZIDINE AND OTHER ARO-MATIC AMINES IN AEROBIC WASTEWATER

Los Angeles County Sanitation District, Whittier, Calif.

For primary bibliographic entry see Field 5B. W77-11733

METHODS FOR THE EVALUATION OF THE RESULTS OF THE SELF-CONTROL-MEASUREMENTS CARRIED OUT BY THE SEWAGE TREATMENT PLANT OPERATORS (VERFAHREN ZUR AUSWERTUNG DER BETRIEBSERGEBNISSE VON KLAERWER-KLAERWER-

Stuttgart Univ. (West Germany). Institut fuer Siedlungswasserbau und Wasserguetewirtschaft. For primary bibliographic entry see Field 5A. W77-11734

VARIATIONS IN NITROGEN AND ORGANICS IN WASTEWATERS, Illinois Univ. at Urbana-Champaign. Dept. of Civil

Engineering. S. J. Randtke, and P. L. McCarty.

Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 539-550, August, 1977. 7 fig, 4 tab, 12 ref.

Descriptors: *Ammonia, *Nitrification, *Diurnal distribution, *Oxygen requirements, *Design data, Nitrogen compounds, Nitrates, Nitrites, Chlorination, Aeration, Municipal wastes, Sewage treat-ment, Treatment facilities, Organic loading, Activated sludge, Organic wastes, Waste water treat-ment. Model studies.

Three activated sludge plants of different size and sludge characteristics were chosen for the examination of variations in nitrogen and organics in waste water. Design data for the San Jose/Santa Clara Water Pollution Control Plant, the Palo Alto Regional Water Quality Control Plant, and the Union Sanitary District Plant No. 3 (Union City) are provided. Treatment methods employed at the three facilities include primary treatment of raw influent sewage, activated sludge aeration, final clarification, and chlorination. At each plant grab samples of raw influent sewage and primary, secondary, and chlorinated effluents were taken at 2 hour intervals. A portion of each sample was filtered and then analyzed for ammonia, soluble COD, and soluble nitrogen (SON). Composite samples prepared according to flow were also analyzed, both filtered (for ammonia, COD, SON, nitrate, nitrite, soluble total organic carbon, and BOD) and unfiltered (for organic nitrogen, COD, BOD, pH, alkalinity, and suspended solids.) Results indicated peak periods of flow in the morning and evening, possibly due to increased domestic use. As ammonia and organics loadings were observed to increase concurrently, plant designs should consider accommodation of large increases in oxygen demand and sufficient aera-tion to insure complete nitrification. Flow equalization, partial nitrification, denitrification, and breakpoint chlorination are also considered for the removal of excess ammonia. (Schulz-FIRL) W77-11735

MEMBRANE FILTER TECHNIQUE FOR THE QUANTIFICATION OF STRESSED FECAL COLIFORMS IN THE AQUATIC ENVIRON-

MENT, Montana State Univ., Bozeman. Dept. of Microbiology. For primary bibliographic entry see Field 5A.

INACTIVATION OF VIRUSES ANAEROBIC SLUDGE DIGESTION. DURING Metropolitan Sanitary District of Greater Chicago,

J.J. Bertucci, C. Lue-Hing, and S. J. Sedita. Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1642-1651, July, 1977. 7 fig, 4 tab, 14

Descriptors: *Viruses, *Epidemiology, *Anaerobic digestion, *Disinfection, *Enteric bacteria, *Sludge disposal, Sludge treatment, Microbiology, Model studies, Microorganisms, Fertilizers, Biocontrol, Sludge disposal, Activated sludge, Waste water treatment. Identifiers: Chicago(IL).

Because enteric viruses may be present in waste water and sludge, the Metropolitan Sanitary Dis-trict of Greater Chicago initiated an investigation of the inactivation of viruses during anaerobic sludge digestion for treated municipal sludge destined for use as fertilizer and for reclamation of strip mines. High concentrations of various viruses, including coliphage MS-2, poliovirus A-9, coxsackievirus B-4 and A-9, and echovirus 11, were seeded into pilot-scale anaerobic digesters. A comparison of virus survival and digestion time indicated that inactivation for the various viruses ranged from 54.4% to 97.6% after 24 hours and from 92.5% to 99.7% after 48 hours. Variations in measurements taken on different days were at-tributed to undefined sludge characteristics other than volatile solids reduction and pH, which were consistent. Linear regression curves for percent survival and time in the digester were calculated for each of the viruses examined, with correlation coefficients ranging from 0.74 to 0.93. The percent inactivation per day of anaerobic digestion, represented by the slope determined by the linear regression, ranged from 74.9% for echovirus 11 to 97.3% for coxsackievirus A-9. (Schulz-FIRL)

PROBLEMS IN IMPLEMENTING U. S. WATER

QUALITY GOALS, California Univ., Los Angeles. Dept. of Geography.

For primar W77-11739 rimary bibliographic entry see Field 5G.

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CURRENT SLUDGE RESEARCH AT THE WRC. For primary bibliographic entry see Field 5E. W77-11741

WATER TREATMENT PLANT DESIGN IS COST-EFFECTIVE, Engineering-Science, Inc., Arcadia, Calif. D. V. MacDonald, and L. Streicher. Public Works, Vol. 108, No. 8, p 86-89, 114, August, 1977. 6 fig, 1 tab.

Descriptors: *Design criteria, *Construction costs, *Energy, *Hydraulic engineering, *Treatment facilities, Model studies, Flocculation, Filters, Sludge disposal, Sludge treatment, Waste water treatment.

A water treatment facility planned for the city of Oceanside, California has been designed for lower than average construction costs and for lower energy and manpower requirements. Provisions for a suction-type traveling sludge collector and a special filter design have reduced construction costs by eliminating the need for below-grade pipe galleries, access tunnels, and pump pits. Designs for static mixing devices should reduce plant power requirements to 30-40% of conventional requirements. The facilities are planned to treat 16 irements. The facilities are planned to treat 16 d, with the plant flow scheme including flash mixing, flocculation, sedimentation, filtration, and mixing, focculation, seumentators, manufacture, and disinfection. Design criteria are listed for chemical mixing, flocculation, settling, filters, backwash recovery, and sludge disposal basins. Hydraulic pressure from the San Diego County Water

Authority's No. 2 aqueduct system is converted to turbulent energy for use in chemical mixing and flocculation, eliminating the conventional need for mechanical energy during these processes. A modified baffle arrangement, designed on the basis of computer calculations of velocity gradient, head loss, and detention time, should provide tapered-energy flocculation at reduced flow rates. Backwash water will be derived from plant effluent. Construction costs for the 16.5 mgd plant are estimated at \$3.7 million, as opposed to \$4.5 to \$5.0 million for a plant of similar size with conventional design considerations. (Schulz-FIRL) W77-11742

THERMAL DRYING OF SLUDGE, Ercole Marelli S.p.A., Milan (Italy). For primary bibliographic entry see Field 5E. W77-11743

EVALUATION OF SETTLING BASIN PER-

FORMANCE, New Haven Water Co., Conn.

E. R. Coppock, III.
Journal of the New England Water Works Association, Vol. 91, No. 2, p 143-164, June, 1977. 4 fig. 4 ref.

Descriptors: *Settling basins, *Suspended solids, *Evaluation, *Design criteria, *Flow control, Flow rates, Sedimentation rates, Floculation, Settling velocity, *Waste water treatment, Sewage treatment, Treatment facilities.

Identifiers: Settling basin efficiency.

An evaluation of settling basin characteristics and performance is presented, with particular emphasis on an 8 mgd treatment facility in New Haven, Connecticut. Factors considered include floc characteristics, temperature and viscosity of the water, and settling basin hydraulics. Observed variations in color, turbidity, and floc distribution in settling basins at the New Haven plant brought about an investigation of the possibility of shortcircuiting of flow through the basins. Flow patterns in the two basins were traced by the addition of sodium chloride to the flash-mix tank and subsequent chloride analysis for samples taken from various areas within the basins. Curves produced for chlorine concentrations as a function of travel were similar for both basins and indicated that the flow was, in fact, being short-circuited by the overlapping slab at the sludge collector return passage and by the normal course of flow through the basin. Calculation of a basin 'efficiency curve' indicated that only 12% of the total basin contents was being detained for the designed theoretical de-tention time. Reduction of the plant flow from 8 mgd to 4 mgd increased the fraction of flow detained to 37% of the total flow. Solutions under detained to 3/% of the total flow. Solutions under consideration include the use of a rubber 'membrane' at the sludge collector return passage to inhibit water flow, extension of the upper apron of the collector passageway, and the construction of baffle plates in the basin to equalize flow. (Schulz-FIRI) (Schulz-FIRL) W77-11744

CHLORINATION DISINFECTION STUDY AT PROPHETSTOWN SEWAGE TREATMENT

Water and Pollution Control, Vol. 115, No. 7, p 14-15, 17, 19, July, 1977. 2 fig, 1 tab.

Descriptors: *Disinfection, *Chlorination, *Model studies, *Bactericides, Equipment, *Enteric bacteria, *Waste water treatment, Water purification, Costs, Chlorine, *Sewage treatment, Treatment. Identifiers: Hypochlorous

The Penberthy unit was designed as an alternative to the conventional diffuser method of disinfection. A pilot study was initiated to determine if the unit could lower costs for disinfection by using less chlorine while still maintaining adequate bactericidal capacities. The Penberthy unit, operating on the principle of the plug flow reactor, rapidly mixes gaseous chlorine and waste water. The for-mation of hypochlorous acid and hypochlorite from the breakdown of chlorine, and the thorough bacteria-chlorine contact brought about by the rapid mixing, result in high disinfection rates for the unit. Tests indicate that the Penberthy unit requires only half as much chlorine to adequately destroy enteric bacteria as the conventional method of disinfection. (Schulz-FIRL) W77-11745

AEROBIC BIO-TREATMENT OF A HIGH-STRENGTH LEACHATE,

Northern Purification Services Ltd., North Vancouver (British Columbia). V. C. Uloth, and D. S. Mavinic

Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 647-661, August, 1977. 4 fig, 3 tab, 12 ref, 1 ap-

Descriptors: *Activated sludge, *Leachate, *Landfills, *Heavy metals, *Biological treatment, Suspended solids, Aerobic treatment, Microorganisms, Design data, Model studies, Chemical oxygen demand, Biochemical oxygen demand, Sludge digestion, Organic loading, *Waste water

An aerobic biological treatment method to process high-strength leachates produced by sanitary landfills is described. The three phases of the study in-cluded: an acclimatization/metal removal study. an 'extended aeration' efficiency study, and a 'shorter detention time' efficiency study. Leachate used in the studies was generated by waste activated sludge from municipal and indus trial sources. The acclimatization/metal removal study established a microbial population in the digester for use in later phases, and examined metal removal by the biological floc while monitoring total solids and BOD. The high levels of mixed liquor volatile suspended solids (MLVSS) of 8,000-16,000 ppm produced in this phase were in excess of those needed for activated sludge processes. Retention time (theta c) and food-tomicroorganism (F/M) ratios were considered with respect to treatment efficiency and metal removal during the second and third phases of the study. With very high MLVSS concentrations and air and mechanical mixing, a retention time as low as 10 days was sufficient for foam control and stable digester operation. Heavy metals at high concentrations did not seem to affect the microbial digester community. High pH values (above 8.5) and high MLVSS in the digesters enhanced metal uptake by the biological floc. COD removals decreased at increasing F/M ratios, and increa with increasing solids retention times for both the mixed liquor and settled effluents. Recommended parameters for optimum treatment of a similar leachate were a retention time of at least 20 days nd an F/M ratio of less than 0.15 kg BOD/kg MLVSS per day. (Schulz-FIRL) W77-11746

WATER QUALITY MANAGEMENT-RESEARCH AND DEVELOPMENT AREAS, Water Pollution Research Lab., Stevenage (England). For primary bibliographic entry see Field 5G. W77-11747

SEWAGE SLUDGE FOR AGRICULTURAL USE, Department of Agriculture, Washington, D.C. Public Information Office. For primary bibliographic entry see Field 5E. W77-11748

Group 5D—Waste Treatment Processes

ULTRAVIOLET LIGHT ENHANCES OZONIZATION OF ORGANICS DISSOLVED IN WASTE-

Chemical Engineering, Vol. 84, No. 16, p 18, Au-

Descriptors: *Ozone, *Ultraviolet radiation, *Polychlorinated biphenyls, *Organic wastes, Organic compounds, Oxidation tion. Waste water treatment. compounds, Oxidation, Chemical degrada-

The Westgate Research Corporation of Los Angeles, California has developed a system for the oxidation of organics from ozone-enriched waste water by exposure to a series of ultra-violet lamps. The method is reported to oxidize all dissolved organic chemicals to carbon dioxide, water, and other oxidation by-products. It also eliminates viruses and other microorganisms. Heavy metals are precipitated as oxides or metals. The process is reported to be more efficient than carbon adsorption and not much more costly. The treatment system will be marketed in 20,000 gal/day modules which may be combined to increase treatment capacity. (Schulz-FIRL) W77-11749

IS THERE A POTENTIAL FOR PARASITIC DISEASE TRANSMISSION FROM LAND AP-PLICATION OF SEWAGE EFFLUENTS AND

Pittsburgh Univ., Pa. Dept. of Life Sciences For primary bibliographic entry see Field 5E. W77-11750

SALVAGING AN OLD SEWAGE PLANT CUTS TERTIARY TREATMENT COSTS. Construction Week, Vol. 199, No. 2, p 23-24, July,

Descriptors: *Tertiary treatment, *Activated sludge, *Filtration, *Model studies, *Water quality, Suspended solids, Biochemical oxygen demand, Chlorination, Polymers, Sludge treatment, Municipal wastes, Cost comparisons, Aerated lagoons, Treatment facilities, Waste water treat-

In upgrading its waste water treatment facilities, Dallas has added activated sludge and filtration treatment to its existing trickling filter plant. The city invested \$38 million to achieve 96% removal of suspended solids and BOD instead of construction new facilities at an estimated \$150 million. Pilot studies were carried out at a plant which contained an activated sludge unit, a flocculation-sedimentation unit, two filtration units, two activated carbon columns, and two chlorine contact basins. Data from this pilot plant, which was designed for flexibility to accommodate changing water quality standards, were used to evaluate design standards for the larger facility. The new plant was designed to meet standards for effluent discharged into the Trinity River of 10 ppm each for suspended solids and BOD, with provisions for more stringent future regulations. Special features in the upgraded facility include chemical control of solids in the activated sludge process and effluent filters; chlorination of activated sludge, to prevent filamentous growth during sedimentation; and the addition of polymer after aeration, to prevent concentration of solids. Annual operating costs are estimated at \$7 million, a \$5 million increase over previous costs for a facility without tertiary treatment. (Schulz-FIRL) W77-11751

AUTOMATIC DISSOLVED OXYGEN CON-

Flanagan and Associates, San Francisco, Calif. M. J. Flanagan, B. D. Bracken, and J. F. Roesler. Journal of the Environmental Engineering Division, Proceeding of ASCE, Vol. 103, No. EE4, p 707-722, August, 1977. 9 tab, 5 fig, 3 ref, 1 append. Descriptors: *Automatic control, *Dissolved oxygen, *Activated sludge, *Aeration, *Cost comparison, Dissolved oxygen analyzers, Cost-benefit analysis, Sludge treatment, Instrumentation, Economic feasibility, Analytical techniques, Operation and maintenance, Maintenance costs, Operating costs, Energy, Waste water treatment. Identifiers: Automatic dissolved oxygen control.

Various types of air and pure oxygen dissolution control systems for use in the activated sludge process are described and evaluated. Aspects of diffused air aeration for the production of air bubbles in mixed liquor include control of centrifugal blowers and the design and operation of diffuses air aeration control systems. Mechanical aerators of plate, updraft, downdraft, combination, and brush types may also be used in the activated sludge process. Possible systems for control of mechanical aeration include on-off aerator control, two-speed aerator control, variable speed aerator control, variable impeller depth control, and variable level control. Cost comparisons for automatic dissolved oxygen control systems and system components are presented. Design data for typical activated sludge plant aeration systems have been calculated according to plant size. Operation and maintenance costs, capital costs, and acquisition feasibility have been estimated for various plant sizes and control systems. The use of automatic dissolved oxygen control is suggested for activated sludge plants handling more than 1 mgd with unequal loading conditions, sufficient oxidation tank or aerator capacity, and unlimited aerator turndown capacities to provide consistent effluent quality and less strain on aeration equipment. (Schulz-FIRL) W77-11752

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW),

Wastewater Treatment. For primary bibliographic entry see Field 5F. W77-11753

RHINELANDER SOLVES I AND I PROBLEMS. Howard, Needles, Tammen and Bergendoff, Mil-waukee, Wis. Dept. of Environmental and Municipal Engineering. R. G. Larget. Water and Wastes Engineering, Vol. 14, No. 7, p

46, 48, 50, July, 1977. 1 fig.

Descriptors: *Sewerage, *Infiltration, *Treatment facilities, *Inflow, *Sewers, Monitoring, Data collections, Manholes, Industrial wastes, On-site data collections, Water utilization, Waste water treat-Identifiers: Rhinelander(WI)

In compliance with EPA regulation PL92-500 an Infiltration/Inflow Analysis, a revised environmental statement, and a facilities plan were provided before construction of a secondary treatment facility at Rhinelander, Wisconsin. The Infil-tration/Inflow analysis included field monitoring of flow in the six major service areas in the system, with HNTB-designed fiberglass weir boxes equipped with interchangeable back plates for variable sewer sizes and stage flow recorders. Field study results and past records on plant operations, climatology, and water usage were used to predict average and peak flow contribu-tions to sub-areas within each service area. Inflow was traced to three sources: 0.12 med added through manhole covers, 0.20 mgd from two groceries and cooling water from an industry, and 0.03 mgd from building roof drain connections. Infiltration rates were significant for one new sewer main, but not appreciable for any area. Costs for the recommended 1.9 mdg plant expansion were projected at \$1.75 million. (Schulz-FIRL)

ALGAE AND HIGH COSTS REMOVE TOGETHER, CH2M/Hill, Inc., Portland, Oreg.

K. V. Leininger. Water and Wastes Engineering, Vol 14, No 7, p 32-35, July, 1977. 2 fig, 21 ref.

Descriptors: *Algae, *Suspended solids, *Ponds, *Tertiary treatment, Sewage treatment, Filtration, Aeration, Dewatering, Cost comparisons, *Waste water treatment.

Identifiers: Stabilization ponds, Sand filtration, Granular media filtration, Chemical treatment.

In response to EPA regulations on stabilization nonds and effluent quality various methods for the removal of algae, BOD, and suspended solids from effluents are discussed, with emphasis on systems handling more than 1 mgd. Methods for improving effluent quality include upgrading of existing stabilization ponds and replacement of ponds by mechanical and chemical treatment facilities. Intermittent sand filtration and the removal of algae by chemical treatment followed by granular media filtration are suggested as the two most reliable alternative methods. Two configurations for chemical treatment and filtration are presented: the replacement of ponds by a secondary treatment facility, and the addition of an initial aerated pond and chemical treatment of pond effluent to existing stabilization pond facili-ties. Although the second alternative may require the acquisition of additional land, its capital, operation, and maintenance costs may be 20% less than for pond replacement. Methods of sludge handling and disposal considered include air drying on sand beds, recycling of chemical-algae sludge to stabilization ponds, mechanical dewatering, and vacuum filtration. Advantages in process flexibility of stabilization ponds include fast star-tup and shutdown, more hydraulic flexibility, and suspended solids removal adjustment by chemical ages. Changes in productivity with weather conditions are suggested as possible disadvantages. (Schulz-FIRL)

INACTIVATION OF POLIOVIRUS IN WASTE-WATER SLUDGE WITH RADIATION AND THERMORADIATION,

Sandia Labs., Albuquerque, N. Mex.

R. L. Ward. Applied and Environmental Microbiology, Vol 33, No 5, p 1218-1219, May, 1977. 2 fig, 11 ref.

Descriptors: *Viruses, *Thermal radiation, *Irradiation, *Bioassay, Sewage treatment, Sludge disposal. Waste water treatment, Human diseases, Pathology, Waste disposal, Microbiology.
Identifiers: *Poliovirus, Virus inactivation, Thermoradiation.

Agricultural uses of treated waste water sludge may be limited by hazardous pathogens present in sludge. Expermental methods to rid sludge of bacterial pathogens, viruses, and parasites include ex-posure to ionizing radiation, alone and in combination with heat (thermoradiation). Since viruses can be insulated from inactivation by raw sludge and a variety of other substances, the effect of sludge on the rate of viral inactivation by radiation and ther-moradiation was investigated. For these experiments the poliovirus type I strain CHAT was diluted 10-fold with phosphate-buffered saline (PBS) which contained appropriate amounts of raw sludge. It was established in control experiments that the D-value (the amount of radiation necessary to inactivate 90% of the virus) in PBS without sludge was 192 krads. The addition of small amounts of sludge to the PBS significantly increased the D-value. The D-value was 332 krads for sludge containing 0.78% solids and 340 krads for 2.34% solids for samples which were heated at 47C for 10 minutes. The D-value approaches a plateau at approximately 1.00% solids, suggesting that small amounts of sludge are nearly as protec-tive of viruses as larger amounts. An investigation

into the effect of raw sludge on poliovirus inactivation showed that although raw sludge was very protective of poliovirus against heat and radiation inactivation, the effects were not additive. This suggests that thermoradiation treatment may be affective method of virus inectivation in wester effective method of virus inactivation in waste water as long as suspended solid concentrations are low. (Schulz-FIRL)

EFFECT OF SHAPE OF PADDLE AND CONTAINER ON FLOCCULATION PROCESS, Visvesvarya Regional Coll. of Engineering, Nag-

pur (India). A. G. Bhole, and P. Limaye.

Journal of the Institution of Engineers (India), Vol 57, Part EN 2, p 52-57, February, 1977. 11 fig, 3 tab, 4 ref.

Descriptors: *Flocculation, *Turbidity, *Design criteria, *Chemical precipitation, *Liquid wastes, Water purification, Colloids, Waste water treat-

Identifiers: *Paddles(D-prime and C-prime shaped).

A study of the controlling factors in the process of flocculation has concluded that the container and paddle geometry, in addition to other physical and chemical factors, can affect floc forma purpose of this study was to examine the effect of paddle and container shape on the removal of tur-bidity during the flocculation process. Container shapes examined were circular, hexagonal, pen-tagonal, square, and triangular. The pentagonal shape created maximum size flocs for fastest settling. Paddle shape was considered while keeping the area of the paddle and the shape of the container constant. A D'-shaped paddle was considered the most efficient for removal of turbidity, with the C'-shaped paddle being the next best. All experiments were conducted on Fuller's earth at pH 7, using acetic acid, sodium hydroxide, and sodium bicarbonate. (Schulz-FIRL)

WASTEWATER FLOW MEASUREMENT IN SEWERS USING ULTRASOUND, Milwaukee Sewerage Commission, Wis. For primary bibliographic entry see Field 7B. W77-11759

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INSTRUMENTATION AND AUTOMATION EXPERIENCES IN WASTEWATER-TREATMENT

Raytheon Co., Portsmouth, R. I. Az. Molvar, J. F. Roesler, and R. H. Babcock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 232,
Price codes: A17 in paper copy, A01 in microfiche.
Report EPA-600/2-76-198, October 1976. 371 p, 18 fig, 11 tab, 24 ref, 3 append.

Descriptors: *Automation, *Automatic control, *Instrumentation, *Data processing, *Waste water treatment, Surveys, Control systems, Monitoring, Waste treatment, Storm water. Identifiers: Control loops, Sensors.

A comprehensive nationwide survey of current and potential instrumentation and automation applications in 50 waste water treatment facilities was conducted to evaluate existing and prospec-tive water treatment practices. The survey revealed that most waste water treatment facilities employ fewer instruments and automatic control devices than similar water supply and chemical processing plants. Flow and level measuring devices comprised much of the instrumentation present in the surveyed facilities. Based on operapresent in the surveyed facilities. Based on opera-tional experiences, the following parameters were considered reliably measurable by commercially available instruments: level, flow, temperature, pressure, speed, weight, position, conductivity, rainfall, turbidity, pH, free and residual chlorine, and free flammable gases. Other sensors and measuring devices were subject to fouling and required more frequent calibration and main tenance. It was observed that although most facilities used automatic devices to control liquid level, liquid flowrate, and air flowrate, other applica-tions of automatic control were limited. Further research into the development of more successful sensors for organic contaminants, suspended solids, storm water, phosphates, and ammonia is suggested. Research into control loops for organic load equalization, food-to-microorganism ratio, break-point chlorination, phosphate removal, and feed-forward DO control is recommended. Computer hardware and software requirements are outlined. (Schulz-FIRL) W77-11760

SELECTED APPLICATIONS OF INSTRUMEN-TATION AND AUTOMATION IN WASTE-WATER-TREATMENT FACILITIES. Raytheon Co., Portsmouth, R. I.

A. E. Molvar.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-263 777, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/2-76-276, December 1976. 312 p, 91 fig, 60 tab, 67 ref, 2 append.

Descriptors: *Automation, *Automatic control, *Instrumentation, *Combined sewers, *Waste treatment, Activated sludge, Cost-benefit analy-sis, Sewage treatment, Waste water treatment.

Automatic controls in waste treatment facilities are considered as a means of maximizing efficien-cy, reducing energy and labor costs, and maintaining consistent effluent quality under variable loading. Various applications for automatic monitoring are discussed, as well as possible sources of error. Among the dry-weather processes considered for Alliong the dry weather automation are: influent pumping and pretreat-ment control, primary sludge pumping, aeration, biodegradation, filtration, secondary sludge pumping, disinfection, anaerobic digestion, slud ditioning, dewatering, incineration, neutralization of acids and bases, and removal of phosphorus. Controls on wet-weather treatment processes and collection systems are considered for three hypothetical catchment areas as a means of alleviating overflow pollution in combined sewer systems. A survey of 50 treatment facilities indicated that far less automatic equipment was in use than was commercially available and reliable. Cost/benefit analyses showed that automatic control of certain processes is feasible for smaller plants (1 to 5 mgd). Processes recommended for automatic control include: prechlorination, aera tion, digestion, disinfection, phosphorus removal, and pH adjustment. (Schulz-FIRL) W77-11761

DISINFECTION EFFICIENCY AND RESIDUAL TOXICITY OF SEVERAL WASTEWATER DIS-INFECTANTS: VOLUME I - GRANDVILLE, MICHIGAN,

Grand Valley State Colleges, Allendale, Mich. Dept. of Biology.
R. W. Ward, R. D. Giffin, G. M. DeGraeve, and R.

A. Stone

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 245, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-76-156, October 1976. 144 p, 1 fig. 50 tab, 86 ref.

Descriptors: *Disinfection, *Chlorination, *Toxicity, *Ozone, *Bromine, Aquatic life, Model studies, Environmental sanitation, Microorgan isms, Environmental effects, Bioassay, Sulfides, Bactericides, Daphnia, Fish, Efficiency, Mu-nicipal wastes, Waste water treatment. entifiers: Bromine chloride, Ozonation, GrandPossible toxic effects associated with chlorination of waste water have prefaced this study on waste water disinfectants. Chlorine, bromine chloride, and ozone were examined for relative bactericidal and ozone were examined for relative bactericidal efficiency and residual toxicity at a waste water treatment plant in Grandville, Michigan. The Grandville plant uses secondary activated sludge processes and chemical removal of phosphates to treat an average flow of 2.6 mgd of municipal wastes. A manually-controlled feed system with a continuous residual chlorine analyzer and recorder is used to chlorinate effluent. For study purposes, a portion of the settled unchlorinated effluent was divided into three streams for ozonation bioassav divided into three streams for ozonation, bioassay, and disinfection with bromine chloride. A portion of the chlorinated stream was dechlorinated with sulfur dioxide. Total and fecal coliform densities, suspended solids, volatile solids, COD, ammonia nitrogen, phosphate, turbidity, color, and pH were monitored for the five waste water streams. Studies indicated that disinfection was more reliable with chlorination, with or without SO2 dechlorination, than with bromine chloride treatment. Disin fection with ozone injection was adequate only after filtration. Acute toxicity tests on Daphnia, fathead minnows, and several species of fish indicated that the toxic effects of chlorination could be eliminated with sulfur dioxide dechlorination. No toxic effects were observed for chlorobrominated or ozonated effluents. (Schulz-W77-11762

WATER RELATED UTILITIES FOR SMALL

WATER RELATED UTILITIES FOR SMALL COMMUNITIES IN RURAL ALASKA, Corvallis Environmental Research Lab., College, Alaska. Arctic Environmental Research Station. B. Puchtler, B. Reid, and C. Christianson. Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-259 964, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/3-76-104, September 1976. 82 p, 17 fig, 5 tab, 5 ref.

Descriptors: "Treatment facilities, "Alaska, "Cold regions, "Sewage treatment, "Municipal wastes, Laundering, Domestic wastes, Potable water, Water utilization, Water reuse, Waste treatment, Incineration, Pilot plants, Model studies, Chemical degradation, Public health, Waste water treatment

Identifiers: Central community facility concept.

The Alaska Village Demonstration Projects (AVDP) were implemented to examine practical solutions to water supply and waste disposal problems where difficult terrain, unfavorable soil conditions, and severe climate prohibit conventional treatment methods. Major objectives of AVDP were to construct and evaluate central community facilities for communities where water community facilities for communities where water distribution and collection systems were unpractical. Design data for the facilities at Wainwright and Emmonak are presented. Treatment of the high quality raw water for drinking purposes included only filtration, carbon adsorption, and chlorination. Treatment systems were provided for graywater (laundry, shower and sink waste water) and blackwater (toilet waste water). Since variety and backwater (unter waste water). Since year-round sources of liquid water were not available, graywater was treated for reuse. Graywater treatment included disinfection with a quarternary ammonium compound, upflow clarification with lime, and chlorination. One problem associated with graywater treatment was variation in plant performance caused by influent temperature fluctuations and sludge carryover from the upflow clarifier. Blackwater was carried to the central facility, chemically treated, centrifuged, and incinerated. The community centers also provided laundry and bathing facilities and potable water for the village inhabitants. The Central Community Carlotte water for the village inhabitants. ty Facility concept was a viable method of provid-ing water services to Alaskan villages when com-bined with a vehicular distribution and collection system. (Schulz-FIRL) W77-11763

Group 5D—Waste Treatment Processes

EFFICIENCY PROBLEMS FROM USER FEES IN MUNICIPAL WASTEWATER TREATMENT, National Bureau of Standards, Washington, D.C. Building Economics Section.
H. E. Marshall, and R. T. Ruegg.

Water Resources Bulletin, Vol. 12, No. 5, p 903-917. October 1976. 2 tab. 8 ref.

Descriptors: *Economic efficiency, *Waste water(Pollution), *Pollution abatement, *Cost sharing, *Legislation, *Regulation, Water resources, Municipal water, Treatment facilities, Financing, Grants, Equations, Industries, Costs,

Identifiers: *User fees, Algebraic expressions, Federal costs, Cost shares, Sensitivity.

The Environmental Protection Agency administers a construction grant program to encourage abatement of wastewater pollution by sharing with municipalties the costs of wastewater treatment facilities. The enabling legislation (P.L. 92-500) specifies that EPA's cost share will be 75% of construction costs. If further requires mu-nicipalities to collect user fees from industrial users of the facilities to repay that part of the federal grant allocable to the treatment of industrial wastewater. The municipality is allowed to retain the remaining half. Retention by municipalities of these user fees lowers their effective cost shares and results in the following consequences: (1) a bias for municipalities to select certain kinds of abatement techniques regardless of whether or not they are the least-cost techniques from the national perspective; (2) a bias for municipalities to select larger-than-optimal scales of abatement facilities; (3) a hidden federal subsidy to industry; and (4) grants that favor industrial communities. This article examines the legislative and regulatory requirements for user charges, derives the algebra-ic expressions for calculation the real federal municipal and industrial cost shares with user fees; computes municipal cost shares for selected values of the determinant factors; evaluates efficiency and other consequences of current user fee ements; and concludes that efficiency distortions caused by the impacts of user fees on cost sharing could be eliminated by requiring that all user fees collected from industry against the federal cost share be returned to the U.S. Treasury. (Bell-Cornell) W77-11783

POLLUTANT REMOVAL FROM COAL-ASH

Texas Univ. Health Science Center, Houston. School of Public Health. For primary bibliographic entry see Field 5A. W77-11784

USE OF IRON SALTS FOR CONTROL OF ACTIVATED SLUDGE BULKING CAUSED BY RIVATED SLUDGE BULKING CAUSED BY SPHAEROTHUS, Illinois Univ. at Urbana-Champaign. Dept. of Nuclear Engineering. J. T. Pfeffer, and Y. Chang.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 321, tion service, springing, vA 22161 as FB-2/2-321.
Price codes: A05 in paper copy, A01 in microfiche.
Illinois Water Resources Center, Urbana,
Research Report No. 127, July 1977. 87 p, 9 tab, 23
fig, 6 ref. S-059-ILL.

Descriptors: *Activated sludge, *Sewage treat-ment, *Waste water treatment, Salts, Iron, Sludge treatment, Bioindicators, *Iron compounds. Identifiers: *Sludge bulking, *Sphaerotilus inhibi-

A continuing operational problem encountered in the activated sludge system is sludge bulking. While there are several causitive agents for this bulking, the filamentous bacterium Sphaerotilus is one of the more common. Control of the growth of this organism will help to eliminate sludge bulking as an operating problem in many activated sludge

systems. Iron has been identified in the literature as a possible inhibitor to the growth of this bacteri-um. However, little is known about the mechanism this inhibition. This study has shown that the adsorption of iron on Sphaerotilus is the major in-hibitory mechanism. The layer of iron on the oranism appears to block the transport of nutrients gains appears to block the transport of nutriens through the sheath and cell wall and hence inhibit the growth of this organism. The effectiveness of the iron compounds in this inhibition corresponds to the physical characteristics of the absorbed iron. Soluble iron complexes form a uniform layer so that the inhibitory effect is proportional to the iron absorbed. Among the soluble complexes, the ferrous forms are more effective. These forms can penetrate the sheath and deposit on or near the cell wall resulting in greater inhibition. On the other hand, the ferric complexes are deposited on or in the sheath of the organism. W77-11789

BIOLOGICAL EVALUATION OF BEST PRAC-TICABLE AND BEST AVAILABLE TREAT-MENT CONTROL TECHNOLOGY
PETROLEUM REFINERY WASTEWATERS. Oklahoma State Univ., Stillwater. Reservoir

Research Center. S. L. Burks, and J. L. Wilhm.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 281, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, (1977). 129 p, 23 fig, 28 tab, 7 re, 2 append. OWRT B-033-OKLA(1), 14-34-0001-6110.

Descriptors: Effluents, Lagoons, *Waste water treatment, Technology, Industrial wastes, *Waste water treatment, Technology, *Oil wastes, *Biological treatment, *Sewage treatment, Inver-

A biological evaluation of conventional secondary biological treatment, Best Practicable Treatment Control Technology and Best Available Technology Economically Achievable was performed to determine the effectiveness of the treatment systems for producing nontoxic effluents from petroleum refining wastewaters. On-site continuous-flow fathead minnow and benthic macroinvertebrate bioassays were used to measure the toxic effects of the test effluents. BATEA, sequential biological treatment-dual media filtration-activated carbon adsorption, improved final effluents by adsorbing slugs of chemicals which had upset the conventional biological treatment systems and thus protected the bioassay organisms from lethal doses of chemicals. A waste stabilization lagoon system produced a final effluent of comparable quality as that of BATEA as measured by changes in species diversity, number of taxa and mean density of benthic macroinvertebrates. BPTCT, sequential biological treatment-dual media filtration, did not significantly improve final effluent quality as measured by fathead minnow and benthic macroinvertebrate bioassays. The technique of using benthic macroinvertebrate colonized artificial substrate samplers as a bioassay tool was developed and successfully demon-strated in this evaluation of wastewater treatment methods used in the petroleum refining industry.

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT THE KANE'OHE MARINE CORPS AIR STA-TION KLIPPER GOLF COURSE,

Hawaii Univ., Honolulu. Research Center. Water Resources

Research Center.
R. H. F. Young, and S. Y. K. Chang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 320,
Price codes: A04 in paper copy, A01 in microfiche.
Technical Memorandum Report No. 53, January 1977. 57 p, 19 fig, 10 tab, 32 ref, 5 append. OWRT A-064-HI(1), 14-34-0001-6012.

Descriptors: *Water reuse, *Irrigation, Reclaimed water, Groundwater, *Environmental effects, *Sewage effluents, *Golf courses, *Waste disposal, Infiltration, Water pollution effects, *Hawaii, Waste water treatment, Treatment facili-

ties. Land disposal, Kane'ohe Marine Corps Air Station, Oahu, Hawaii, Low humic latosols, Jaucas, Regosols.

An investigation of waste water reuse by spray irrigation was conducted at the Kane ohe Marine Corps Air Station (KMCAS) Klipper Golf Course on Oahu. The study was conducted in three phases: (1) waste water characterization of the phases: (1) waste water characterization of the KMCAS Sewage Treatment Plant, (2) ground-water quality analysis, and (3) air quality analysis of indicator bacterial levels during spray irrigation with waste water Waste water analyses showed that the KMCAS Sewage Treatment Plant, employing the trickling filter process with a final polishing pond, is capable of removing a high per-centage of biodegradable substances and centage of biodegradable substances and suspended solids. The effluent appears to be of good quality for agricultural irrigation use. High concentrations of sodium and chloride, due to brackish groundwater infiltration into the sewage system, were not considered to be a hazard to the salt-tolerant bermudagrass. The two predominant soils on the KMCAS Klipper Golf Course, the Ewa silty clay loam (Low Humic Latosols) and the Jaucas (Regosols), appeared to be very effective in removing nitrogen, phosphorus, and fecal coliforms from the applied effluent. The quality of the perchlorate does not present a hazard to the groundwater quality. Runoff from the golf course does not present a hazard to the adjacent surface waters. Analyses of spray irrigation fallout sam-ples at the KMCAS Klipper Golf Course resulted in the isolation of coliform bacteria up to 91 m (300 ft) downwind of the sprinkler sources. Coliform bacteria recovery rates depended upon the initial coliform bacterial concentrations in the effluent and upon wind velocities. The presence and con-centration of aerosolized coliform bacteria were not considered a public health hazard to golf course users, workers, or nearby residents. W77-11792

LABORATORY STUDIES OF UPGRADING EF-FLUENT WATER QUALITY FROM SEWAGE LAGOONS.

Montana State University, Bozeman. Dept. of Civil Engineering and Engineering Mechanics. R. L. Sanks.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-272 312, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 84, March 1977. 77 p, 8 fig, 17 tab, 70 ref. OWRT A-089-MONT(1), 14-34-0001-6027.

Descriptors: *Sewage lagoons, *Oxidation lagoons, Algae, Water pollution, Suspended solids, Nutrients, Filtration, Coagulation, *Montana, *Water quality, *Waste water treat-Suspended Identifiers: Microstraining

Water from a municipal sewage lagoon was treated in the laboratory by four processes: coagulation, rock filtration, intermittent sand filtration and rapid sand filtration. All processes were capable of producing effluent that would nearly meet (and some would exceed) the requirements of Public Law 92-500. Rapid sand filtration was impractical due to short filter runs. An extensive literature search revealed that the processes of greatest promise for effectiveness, reliability, and econopromise for effectiveness, renability, and econo-my under Montana conditions appear to be: inter-mittent sand filtration, seasonal discharge at selected times, and integrated ponding systems with enclosed chambers or deep lagoons designed to remove algae by sedimentation. A realistic field research program is needed to evaluate the reliability and economy of these processes for upgrad-ing Montana lagoons. (Stuart-Mont State)

W77-11793

FUNDAMENTAL STUDY OF REMOVAL MECHANISMS OF SUSPENDED PARTICLES IN THE DEEP FILTER (III) (KYUSOKU ROKAROSO NO KYODO (III): TEIJO ROKAJI NO RIHAKU TO SONO SAYO KIKO NO KENTO), K. Ebie.

Journal of Japan Water Works Association, No. 507, p 20-34, December, 1976. 9 fig, 2 tab, 19 ref.

Descriptors: *Suspended particles, *Flocculation, *Filtration, *Microscopy, *Filters, Colloids, Slurries, Suspension, Waste water treatment, Water

Microscopic examination of particles undergoing filtration has been used to better understand filtration theory. Experimental observation of deposit behaviors during direct filtration was made through the microscope by camera. It is suggested that two modes of floc particle breakdown occur. Minute suspended particle size breakdown occurs continuously during the filter run, while cluster breakdown of deposit thickness size occurs intermittently at a later stage. Mechanisms such as electrophoretic mobility which affect particle breakdown in filtration are discussed. (Schulz-FIRL) W77-11829

PHYSICAL-CHEMICAL TREATMENT OF A MUNICIPAL WASTEWATER USING POW-DERED CARBON: NO. II, Envirotech Corp., Salt Lake City, Utah. Eimco

BSP Div. D. E. Burns, R. N. Wallace, and D. J. Cook

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-263 134, Price codes: A15 in paper copy, A01 in microfiche. Report EPA-600/2-76-235, November 1976. 328 p, 106 fig, 54 tab, 17 ref, 3 append.

Descriptors: *Activated carbon, *Chemical degradation, *Filtration, *Adsorption, Dewatering, Sewage treatment, Model studies, Diurnal distribution, Chemical oxygen demand, Suspended solids, Phosphorus, Treatment, Municipal wastes, Effluents, Water quality, Pilot plants, Waste water treatment.

Identifiers: *Physical-chemical treatment, Powdered carbon, Carbon sludge thickening, Ferric chloride, Alum, Fluidized bed furnace, Salt Lake

Chemical coagulation-precipitation followed by powdered activated carbon adsorption and granular media filtration has been examined as a method of physical-chemical treatment of waste water g a pilot study in Salt Lake City. With alum or FeCl13 pretreatment, two-stage counter-current powdered carbon contacting, and typical diurnal flow conditions, the process produced high quality effluent with less than 5 mg/liter COD, 5 mg/liter suspended solids, and 0.3 mg/liter phosphorus. In excess of 90 percent of used carbon was regenerated using a fluidized bed furnace. No significant loss of treatment effectiveness was observed when thermally regenerated carbon was reused in the powder activated carbon process.

Costs for the alum-powdered carbon treatment of 10 mgd of Salt Lake City waste water were estimated at 36.2 cents/1000 gal and were reduced to 33.4 cents/1000 gal when carbon was thermally regenerated and reused. Cost sensitivity studies. comparison of parallel granular and powdered carbon systems, further pilot studies, and an evaluation of chemical-primary sludge dewatering alternatives are recommended. (See also W74-00154) (Schulz-FIRL) W77-11830

ic al re THE USE OF POLLUTED SOURCES FOR

WATER SUPPLY, North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5F.

FINAL ENVIRONMENTAL IMPACT STATE-MENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON.

Environmental Protection Agency, Seattle, Wash

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-243 991, Price codes: Al9 in paper copy, A01 in microfiche. June 13, 1975, 258 p., 14 fig, 35 tab, 5 append. EPA-

Descriptors: *Environmental effects, *Interceptor Descriptors: *Environmental effects, *Interceptor sewers, *Washington, *Wetlands, *Sewage disposal, *Growth rates, Revegetation, Water quality, Sludge disposal, Alternate planning, Land use, Planning, Air quality, Air pollution, Ecosystems, Habitats. Identifiers: *Seattle(WA), King County(WA), Auburn Interceptor sewers, *Environmental Impact Statement, *Environmental impacts, Green River.

The subject action for this Environmental Impact Statement is the awarding of grant funds to the Municipality of Metropolitan Seattle for the construction of an interceptor sewer line in King County, Washington, to service the Green River Sewerage Area. Major adverse primary impacts and mitigative measures are detailed. The construction corridor passes through a small per-manent wetland. summer construction with revegetation, or relocation of the pipeline, are alternatives. The interceptor will cause an increase in the effluent dischargedd by the sewage treat-ment plant which could diminish water quality. Dechlorination, low flow augmentation, and advanced treatment are possible remedies. Sludge removal alternatives include provision of digestors at other locations, or removal by barge. No adverse impacts are anticipated on archaeological, historical, or cultural resources. Major adverse secondary impacts resulting from growth and development are detailed. Surface water quality will decrease due to urban runoff. Total suspended particulates in the air will exceed secondary standards. There is a potential for loss of wetlands, vegetation, and wildlife habitat, given the present local land use plants. Mitigative measures are suggested. Several alternatives to the Auburn Interceptor are described and evaluated. (Nessa-NC)

EXPERIENCES DEMINERALIZATION OF SECONDARY EF-FLUENT USING ELECTRODIALYSIS, Environmental Protection Agency, Cincinnati,

Ohio.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-245 748, Price codes: A03 in paper copy, A01 in microfiche. Report Presented at 39th Annual Meeting of the Water Pollution Control Federation, Kansas City, MO on Sept. 29, 1966, October 1966. 37 p, 7 fig, 5

Descriptors: *Water purification, *Water quality control, *Demineralization, *Water reuse, Tertiary treatment, Separation techniques, *Electrodialysis, *Waste water treatment.

Electrodialysis is one method for partially demineralizing water. Bench-scale studies demonstrated that the process might be economically practical for removing up to one half of the mineral matter from properly pretreated seconda-ry effluent. A pilot plant was constructed at Lebanon, Ohio to determine what operating problems might be encountered in an actual plant,

and to realistically estimate the cost of operation.

A flow diagram for the electrodialysis stack and pretreatment system is shown. Secondary effluent is fed to a diatomaceous earth filter for clarification. The clarified water from the filter enters a storage tank prior to entering the activated carbon columns. The purpose of the tank is to provide a supply of water for the remainder of the system during filter backwash. The water is pumped next through three carbon columns in series for removal of soluble organics. Water leaving the carbon columns enters a small holding tank which serves as a constant head tank for the electrodialy sis stack. It is designed to remove about 40% of the mineral matter from the feed water. The membranes are standard brackish water type and dynel backed. Stack assembly and stream flow details are shown. The polyethylene spacers are of the tortuous path type and serve as perimeter gaskets and spacers. The concentrate stream leaving the stack is recirculated back to the stack after mixing with makeup water. This is done to keep the flow rate through the concentrate compartments nearly the same as through the diluting compartments. (Sinha - OEIS)

REMOVAL OF MERCURY FROM AQUEOUS SOLUTIONS EMPLOYING NAVAL STORES PRODUCTS.

artment of Agriculture, Washington, D.C.

W. H. Schuller. Patent Application Serial No. 498,164, August 16, 1974.9 p.

Descriptors: *Patents, *Mercury, *Water pollu-tion treatment, *Industrial wastes, Chemical wastes, Filtration, Separation techniques, *Waste water treatment.

Identifiers: Naval stores products, Tar, Pitch, Tur-

Dilute solutions of mercury in aqueous solutions can be lowered drastically in mercury concentra-tion by adding certain naval stores products such tion by adding certain naval stores products such as tall oil soap, sall oil soap, tall oil rosin, and others, shaking the mixture, and filtering the solution. Insoluble mercury salts are formed. If solutions of mercuric ions above 100 ppb are used, the naval stores products mentioned will reduce the mercury content to a substantial degree. Further treatments with fresh portions of the naval stores products and removal by filtration, after assistation, will continue to reduce the level of meragitation, will continue to reduce the level of mercury. The naval stores materials, after being used to remove mercury, can then be converted into copper resinates, which are used as fungicides. (Sinha-OEIS) W77-11916

THIN CELL ELECTROMEMBRANE SEPARA-TOR.

Department of the Interior, Washington, D.C. For primary bibliographic entry see Field 3A. W77-11917

REMOVAL OF TRACE COPPER IONS FROM

WATER, Department of the Interior, Washington, D.C. Valdes-Krieg. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-250 894, Price codes: A02 in paper copy, A01 in microfiche. Patent Serial No. 650,395, Filing Date 19 January 1976. 11 p, 1 fig.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, *Foam fractionation, Ions, *Separation techniques, Water purification, Bubbles, Surfactants, Copper, Metals, *Trace ele-Identifiers: *Copper ions.

The invention consists of a method for separation and recovery of metal ions, particularly copper

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ions, from dilute aqueous solutions by means of a bubble fractionation process employing counter-current contacting of the feed solution with a stream of gas bubbles and a surface-active agent. This is achieved by utilization of an elongated vertical fractionation column, with feed solution being continuously introduces near the top of the column, and the gas bubbles and surfactant, or solution, beign continuously introduced near the bottom of the column. Surfactant loading at the gas-liquid interface substantially throughout the length of the column is thereby obtained, resulting in improved separation of metal ions. The invenrovides an improved method for reduction of metal ion content of aqueous streams, as well as for metal ion enrichment for ultimate recovery of the metal. (Sinha - OEIS) W77-11919

REMOVAL OF EXPLOSIVE MATERIALS FROM WATER BY CHEMICAL INTERACTION BASIC ION EXCHANGE RESINS

Office of Naval Research, Arlington, Va. J. C. Hoffsomner, L. A. Kaplan, D. A. Kubase, and D. Glover, Jr.

ble from the National Technical Information Service, Springfield, VA 22161 as AD/D002 301, Price codes: A02 in paper copy, A01 in microfiche. Patent Serial Number 649,441, Filing date, 15 January 1976. 10 p.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Separation techniques, *Anion exchange, Resins, Chemical reactions, exchange, *Explosives, *Ion exchange.

The invention relates to the removal of explosive materials from water contaminated with them by treatment on an ion exchange resin. It has been discovered that when an aqueous solution containing a hydrolyzable, non-aromatic, nitroso- or nitro-substituted explosive compound is brought into contact with a strongly basic anion exchange resin, the resin performs two functions in that it substantially removes all of the explosive material from the solution and renders the explosive material harmless by decomposition to harmless products. (Sinha-OEIS) W77-11921

PROCESS FOR REMOVING OIL FROM OILY WASTE WATER STREAMS, Exxon Research and Engineering Co., Linden,

N.J. (Assignee). M. Vadekar, and H. S. Wilson. U.S. Patent No 4,008,160,4 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937, February 15, 1977.

Descriptors: *Patents, *Oil pollution, *Oily water, *Waste water treatment, Industrial wastes, Separation techniques, Emulsions, Polymers, Absorption. Polyvinyl

Refinery wastes, chlorides(PVC).

A process for removing oils from oily waste water streams or in particular a process for removing oil from aqueous refinery streams where the oil is present in the stream as free oil and as an oil-in-water emulsion is described. The oil is removed from the water by passing the stream over a par-ticulate bed of vinyl chloride containing polymers such as PVC and its copolymers. The free oil may be saturated or unsaturated. If it is saturated, then it is removed from the water primarily by physical adsorption onto the surface of the polymer. The emulstified oil is absorbed by and at least partially plasticizes the vinyl chloride containing polymeric media. (Sinha-OEIS) W77-11922

TREATMENT OF PULP MILL EFFLUENTS, Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec). (Assignee).

A. Wong, S. Prahacs, and J. Dorica. U.S. Patent No 4,008,161, 6 p, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Organic wastes, *Water pollution treatment, Water purification, Oxygenation, Activated carbon, Toxicity, *Pulp wastes, Pulp and paper industry.

A multi-step method is provided for the purifica-tion of waste water, especially pulp mill effluents. It comprises a number of steps carried out in a specific sequence. The first step involves passing an oxygen-containing gas through the waste water while the waste water is in intimate contact with a finely divided activated carbonaceous material. The second step involves adding a clarification agent selected from one or more of a coagulant, a flocculant, and a polyelectrolyte. The third step involves a clarification step carried out by gravitational, flotational or centrifugal means to provide the waste water free of the suspended material and a sludge including the suspended material originally contained in the waste water, the added carbon and the added clarifying agent. Optionally, it includes the fourth step of regenerating the carbonaceous material from the sludge, and/or the fifth step of regenerating the clarification agent from the sludge. (Sinha-OEIS) W77-11923

WASTE TREATMENT OF FLUOROBORATE SOLUTIONS.

Dart Industries, Inc., Los Angeles, Calif. T. F. Korenowski, J. L. Penland, and C. J. Ritzert. U.S. Patent No 4,008,162, 11 p, 7 fig, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 3, p 937-938, February 15, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Chemical reactions, Hydrolysis, Calcium. Identifiers: Metal finishing industry, *Fluoroborates, Rinse water.

A two-step process for the waste treatment of A two-step process for the waste treatment of fluoroborate solutions involves hydrolysis at an acidic pH in the presence of calcium ions to liberate fluoride. The liberated fluoride, hydrofluoric acid and calcium fluoride formed in this raction can then be treated by any number of techniques known in the art for removal of fluoride values from solution. One such applicable method involves neutralization of the solution with an alkaline compound and precipitation of fluoride as calcium fluoride under alkaline condi-tions. (Sinha-OEIS) W77-11924

RECYCLE TREATMENT OF WASTE WATER FROM NICKEL PLATING, Kayabakogyo-Kabushiki-Kaisha, Tokyo (Japan).

(Assignee).

U.S. Patent No 4,009,101, 9 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1263, February 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, *Water pollution treatment, *Separation techniques, Chemical reactions, Chemical precipitation, Ion exchange, Filtration, Nickel, *Pecuclina* Recycling.
Identifiers: *Nickel plating industry wastes, Rinse

Nickel plating waste water is treated with cation resins so as to adsorb the nickel ions, which are eluted by sulfuric acid to obtain an aqueous nickel salt solution containing excess sulfuric acid. A portion of this eluted solution is mixed with an al-kali to convert the nickel contained into nickel

hydroxide for removal by filtration, and the nickel hydroxide so obtained is added to the rest of the eluted solution to react with the free sulfuric acid so as to form a highly concentrated nickel sulfate solution while the free sulfuric acid concentration is reduced. In other words, the solution eluted from the cation resins, which had adsorbed nickel ions, is divided into two portions. The nickel components in one portion is recovered in the form of nickel hydroxide through chemical treatment, and the nickel hydroxide so obtained is added to the rest of the eluted solution so as to neutralize the free sulfuric acid, and thus, a highly concentrated nickel salt solution is obtained. (Sinha-OEIS) W77-11929

METHOD FOR IMPROVING THE FILTERA-BILITY OF ALUMINUM SALTS
PRECIPITATED FROM AQUEOUS SOLU-

TIONS, Teepak, Inc., Chicago, Ill. (Assignee). N. I. Burke.

U.S. Patent No 4,009,103, 4 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1264, February 22, 1977.

Descriptors: *Patents, *Waste water treatment, Industrial wastes, *Separation techniques, Water quality control, Chemical reactions, Chemical precipitation, Hydrogen ion concentration, Aluminum, Food processing industry, Filtration.

Identifiers: Collagen food casings, *Aluminum

This invention relates to a method of treating waste effluent from the manufacture of collagen food casing to remove and recycle aluminum salts. The filterability of aluminum salts precipitated from an aqueous solution containing dissolved aluminum ion is improved by adjusting the pH of the solution to between about 4 and 6, adding less than a stoichiometric amount of a 1,3-dicarbonyl com-pound such as acetylacetone to the solution to precipitate the aluminum dicarbonyl and then adding a sufficient amount of an alkaline hydroxide to precipitate the remaining dissolved aluminum ion in the form of aluminum hydroxide to obtain a mixed precipitate which can be readily filtered. (Sinha-OEIS)

IMPACT OF HATCHERY WASTEWATER IR-RIGATION UPON CONTIGUOUS STREAM **OUALITY.**

North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. J. C. Barker, F. J. Humenik, M. R. Overcash, F. Koehler, and R. Phillips.

Paper No. 76-2566, American Society of Agricultural Engineers, 1976 Winter Meeting, Chicago, Illinois, Dec. 14-17, 1976, 8 p. 1 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, Irrigation, Agricultural runoff, Water pollution, Sampling, Chemical analysis, Nitrogen, Rainfall, Fescues, Farm wastes, Separation techniques, Waste treatment, Cleaning.

Identifiers: Hatchery wastes, Land application, Nonpoint sources, Coastal Bermuda grass.

A waste management system was designed for Chick Sales, Inc., Siler City, North Carolina, in which hatchery wastes are taken care of by inhouse cleaning and separation processes prior to entry into an extramural septic tank, aerated lagoon and polishing-storage pond series, permanent-set irrigation system. The capability of land application via this irrigation system for handling a no-discharge goal is evaluated on the basis of the monitoring of the stream into which the ir-rigated fescue pasture and the irrigated Coastal Bermuda pasture drained. The following conclusions were drawn: (1) No observed differences at the 0.05 level of significance were indicated in con-tiguous stream COD, TOC, TKN, NH3-N and TPO4 concentrations as a result of rainfall runoff from Coastal Bermuda and fescue pastures irrigated with hatchery wastewater. (2) Although maximum stream impact from nonpoint sources would be expected during runoff events, no significant differences were observed between background and impacted stream reaches when runoff events were examined separately. (3) Land application receiver plots should be designed so application receiver plots should be designed so that the rate of nitrogen application in wastewater does not exceed crop uptake. (4) Except for the mobile nitrate ion which tends to be released to surface waters during soil-water interflow rather than surface flushing, it appears that nonpoint source sampling and routine chemical analysis is justified only during rainfall runoff events. Furthermore, samples should be collected throughout the entire runoff hydrograph. (Merryman-East Central) W77-11973

RECURRENT PROBLEMS OF WATER SUPPLY

IN MALTA, Dundee Univ. (Scotland). For primary bibliographic entry see Field 3A. W77-11988

MEETING WATER-RECYCLE REQUIRE-MENTS AT A WESTERN ZERO-DISCHARGE

Public Service Co. of New Mexico. R. E. Dascher, and R. Lepper. Power, Vol 121 No. 8, August, 1977, p 23-28, 2 tab,

Descriptors: *Electric powerplants, *Water pollution, *Waste water treatment, *Recirculated water, *Water quality control, Water quality standards, Water treatment, Water utilization, Water vapor, Powerplants, Reverse osmosis, Evapora-tors, Arid lands, Pre-treatment(Water), New Mex-

ico, Recycling, Water management.

Identifiers: Vapor-compression evaporator,
Evaporation ponds, San Juan generating station,
Sludge removal system, Flue-gas desulferization.

Describes efforts of the Public Service Company of New Mexico to meet state and federal waterrecycle requirements by reducing its San Juan generating station's wastestream discharges and enhancing wastewater recovery. Evaporation ponds, a vapor compression evaporator, a reverseosmosis unit, and other pretreatment processes were utilized. Because more wastewater was produced than could be recycled for use in some plant processes, a de-salting method using a large vapor-compression evaporator was exployed. After a year of operation, plant wastes and blowdown streams were greater than anticipated. Because of high acidity and dissolved solids, wastes from plant de-mineralizers could not be used as makeup. Also, in response to additional wastes from subsequently installed units, new water balance calculations showed more wastewater needed desalting. A reverse osmosis method in conjunction with the evaporator was chosen to handle the extra treatment load. A neutralization sludge-removal system for flue-desulferization, increased holding-pond capacity, and product-water-storage tanks were included in the total design of the system. Although some operational problems were found, performances for the reverse-osmosis and evaporator units were con-sidered satisfactory. (Ullery-Arizona) W77-12006

GROWTH OF SIX SPECIES OF BIVALVE MOL-LUSCS IN A WASTE RECYCLING-AQUACULTURE SYSTEM,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5C. W77-12070

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BACKWASH OF GRANULAR FILTERS USED IN WASTEWATER FILTRATION, lowa State Univ., Ames.

J. L. Cleasby, and E. R. Baumann. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-266 693,

Price codes: A17 in paper copy, A01 in microfiche. Report EPA-600/2-77-016, April 1977. 381 p 110 fig, 53 tab, 145 ref, append.

Descriptors: *Filters, *Particle size, *Packed beds, *Equipment, *Filtration, Cleaning, Operation and maintenance, Separation techniques, Clarification, Sewage treatment, Waste water

Identifiers: *Backwashing, Granular filters.

The design, operation, and maintenance of deep granular filters used in waste water treatment are examined, with special emphasis on bed design, media size, and bed cleaning by backwashing for single-, dual-, and triple-media filters. Backwashing methods discussed include water fluidization, air scour followed by water fluidization, face wash and subsurface wash before and during water fluidization, and simultaneous air scour and sub-fluidization water backwash. Backwashing by water fluidization alone is considered too inefficient since abrasion between filter grains was negligible. Simultaneous air scour and subfluidization backwash of coarse sand filters is considered the most effective method of backwash, but results in media loss for finer materials. remaining methods are considered acceptable for single-, dual-, and triple-media filters. Studies on filter performance indicate that filtering abilities of dual- and triple-media filters were comparable. Filter bed expansion, media intermixing, and the use of dual media are further examined. Filter designs are discussed with respect to performance and media size. A literature survey on waste water filtration and backwashing is presented. (Schulz-W77-12077

METHODS FOR IMPROVEMENT OF TRICK-LING FILTER PLANT PERFORMANCE: PART II - CHEMICAL ADDITION,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.

J. C. Brown, and L. W. Little. Available from the National Technical Informa Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-266 424, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-012, January 1977. 120 p, 27 fig, 38 tab, 19 ref, 2 append.

Descriptors: *Phosphorus, *Nutrient removal, *Trickling filters, *Coagulation, Model studies, Separation techniques, Chemical precipitation, Sludge treatment, Dewatering, Filtration, Sewage treatment, Sludge digestion, Waste water treat-

Identifiers: *Aluminum sulfate, Chapel Hill(NC).

Laboratory, pilot, and full-scale studies at the Mason Farm Waste Water Treatment Plant, Chapel Hill, North Carolina, were used to examine methods of phosphorus removal. Preliminary studies on phosphorus removal included a survey of pertinent literature, jar testing of various coagulants (lime, alum, and iron salts), studies on the quality and quantity of plant flows, and examina-tion of the effect of the time of alum addition during high-rate trickling filtration. Full-scale studies were then conducted using the two parallel identi-cal treatment trains at Chapel Hill, with liquid alum dosages and flow rates varying for one train and the other train serving as a control. Plant flows, digester performances, and sludge production were monitored throughout the 18-month tion were monitored inrougnout the 18-month study, as were qualitative parameters on raw waste water, primary effluents, and secondary effluents. Results indicated that overall plant operation and the removal of phosphorus were enhanced by the addition of alum, particularly with a flow-paced alum feed system, limitation of dry weather settling tank surface loadings to 20.4 cu m/sq m/day, and fine solids removal by tertiary treatment. Alum addition resulted in decreased

buffering capacities, alkalinity, and pH in primary digesters and lower solids concentrations in the secondary digester. Longer sand drying was there-fore required for adequate sludge dewatering. At an alum dose of 175 mg/liter and cost of \$58/ton of dry alum, alum treatment costs were \$41/million gallons of waste water. (See also W74-00431) (Schulz-FIRL)

ANAEROBIC AND AEROBIC TREATMENT OF COMBINED POTATO PROCESSING AND MU-NICIPAL WASTES, North Dakota Univ., Grand Forks.

J. K. Neel, J. W. Vennes, G. O. Fossum, and F. B.

Orthmeyer. Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-265 009, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-600/2-76-236, September 1976. 132 p, 22 fig, 30 tab, 14 ref, 1 append.

Descriptors: *Aerobic treatment, *Anaerobic digestion, *Potatoes, *Industrial wastes, *Biochemical oxygen demand, Chemical oxygen demand, Lagoons, Aerated lagoons, Municipal wastes, Design criteria, Model studies, Settling basins, Costs, Food processing industry, Waste

Identifiers: Grand Forks(ND), Potato Processing

The use of unmixed detention and aeration in open ponds in the treatment of combined potato processing (72%) and municipal (28%) wastes was evaluated in a model study in Grand Forks, North Dakota. In a year-long study using four 0.94 hec-tare cells which received 13,409 Kg BOD daily for 9 months and 3,773 Kg daily for 3 months, the anaerobic-aerated series operation was observed to provide maximum BOD removal at 76% and COD removal at 64%. Variations in the pH of raw waste were controlled by the BOD concentration, which was, in turn, related to the activity of the potato processing industry. Although the treatment method did not remove phosphorus, it reduced nitrogen by as much as 30% to a final concentration of 43 mg/liter and was effective at air temperatures down to -35 C. Temperature and strength did, however, affect bacterial growth and volatile acid production. Organic solids were not settled in aerated cells, but did decrease in anaerobetted in aerated cells, but the decrease in aniacro-bic cells. Construction suggestions include em-bankment slope protection, provision for gravity dewatering, and the avoidance of steel metal works, narrow dikes, and thin-walled airfines. Construction costs for the four-cell system were estimated at \$672,000. Operational costs were esti-mated at 4.31 cents per kilogram of BOD satisfied. (Schulz-FIRL)

THE SWIRL CONCENTRATOR FOR EROSION

RUNOFF TREATMENT, American Public Works Association, Chicago, Ill. R. H. Sullivan, M. M. Cohn, J. E. Ure, F. E. Parkinson, and P. E. Zielinski.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-266 598, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-76-271, December 1976. 74 p, 46 fig, 5 tab, 6 ref, append.

Descriptors: *Separation techniques, *Erosion control, *Storm runoff, *Suspended solids, Silting, Soil erosion, Surface runoff, Flow rates, Overflow, Waste water treatment, Storm water, Equipment, Design, Research and development, fodel studi Identifiers: *Swirl concentrator, Erosion runoff.

The applicability of the swirl solids-liquid separator has been examined for the removal suspended solids from storm water erosion flows. The swirl concentrator consists of a circular flat-botto basin which contains an internally-supported over-

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flow weir, flow spoilers, a concentrate discharge take-off, and a baffled inlet. A cattle watering tank is suggested as a possible swirl concentrator basin. In a series of 62 performance tests, the swirl concentrator reduced the volume of grit-containing waste water by 14-50%. The desilted or clarified effluent could be discharged directly to reieving waters provided erosion solids met existing standards, while the concentrated grit-containing portion could be directed to settling ponds for later disposal. Further studies and possible design modifications on the prototype are suggested to establish standards for future use of the swirl concentrator in the treatment of erosion runoff waters. (Schulz-FIRL)

A REVIEW OF TECHNIQUES FOR INCINERA-TION OF SEWAGE SLUDGE WITH SOLID

Weston (Roy F.), Inc., West Chester, Pa. W. Niessen, A. Daly, E. Smith, and E. Gilardi. Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 355, Price codes: Al1 in paper copy, A01 in microfiche. Report EPA-600/2-76-288, December 1976. 236 p, 30 fig, 47 tab, 60 ref, 4 append.

Descriptors: *Incineration, *Economic feasibility, *Sludge disposal, *Cost comparisons, *Reviews, Sewage treatment, Dewatering, Environmental effects, Municipal wastes, Waste water treatment. Identifiers: *Co-incineration, Direct-drying incineration, Multiple-hearth incineration, Indirect-drying incineration, Emissions controls, Incineration methods.

This comparison of co-incineration with separate municipal sludge and refuse incineration provided a state-of-the-art review of co-incineration practices and examined economic feasibility, environmental effects, and economic impact. Four methods of co-incineration were chosen for further study. Applicable techniques of current users of co-incineration for mixed municipal refuse and municipal sewage sludge were described. Feasibility studies were conducted for direct-drying, indirect-drying, multiple-hearth and pyrolysis co-incineration. Air pollution aspects and emissions controls for incineration were discussed. Economic considerations include basic cost calculations and cost comparisons for esparate disposal and co-incineration. Circumstances which may affect co-incineration feasibility, such as geography, local political situations, public and private considerations, and funding, were presented. (Schulz-FIRL.)

SELECTED ORGANIC PESTICIDES OCCUR-RENCE, TRANSFORMATION AND REMOVAL FROM DALLAS DOMESTIC WASTEWATER, Texas Univ. at Dallas, Richardson. F. Y. Saleh.

PhD Thesis, 1976, 214 p.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Pesticide removal, *Pollutant identification, *Water purfication, Chemical analysis, Biological treatment, Chemical reactions, Coagulation, Filtration, Activated sludge, Activated carbon, Municipal wastes, Domestic wastes, Waste water treatment. Identifiers: Dallas(TX).

A pilot study was conducted of the occurrence, transformation, and removal of chlorinated organic pesticides from waste water in Dallas, Texas. The plant studied contained completely mixed activated sludge units, chemical treatment, mixed-media filters, and activated carbon beds. Activated sludge units were operated in a nitrifying mode. Alum-lime and lime-ferric chloride mixtures were used as coagulants. The first study phase developed a characteristic profile of organic residues in feed and effluent from each process

and traced the effects of each unit on the profile. Identification and quantification of major components, detected in the residue profiles, composed and second phase. The two-year study revealed a limited number of peaks with a relative retention time of 0.36 to 4.2. Major peaks were less than 1.3. These peaks were identified as aldrin; dieldrin; op DDT and its analogs; pp DDT and its analogs; 2,4-D alkyl esters; and inorganic salts of 2,4-D. Activated sludge biological treatment removed insignificant amounts of chlorinated organic pesticides. Transformation of one compound to another was characteristic of this process. Alum-lime and lime-ferric chloride treatment slightly reduced detected organic residues. Only DDT compounds were removed by chemical coagulation. Variable reductions were found for aldrin, dieldrin, and 2,4-D alkyl esters. Multimedia filters evidenced no effectiveness in the removal of organic residues from activated sludge effluents or solids contact effluents. Activated carbon columns were found best for removing chlorinated organic pesticides from chemically treated and filtered waste water. After a year, breakthrough of some compounds was observed in the activated carbon tests. (Collins-FIRL)

OCCURRENCE OF ESCHERICHIA COLI B BACTERIOPHAGES IN MUNICIPAL WASTE-WATER AND THEIR REMOVAL AND INAC-TIVATION BY ACTIVATED SLUDGE SEWAGE TREATMENT,

Miami Univ., Fla. For primary bibliographic entry see Field 5A. W77-12140

A KINETIC ANALYSIS OF AMMONIA REMOVAL BY CHLORAMINE CONVERSIONS ON ACTIVATED CARBON, Massachusetts Univ., Amherst.

Massachusetts Univ., Amherst A. B. Scaramelli, Jr. PhD Thesis, 1976, 182 p.

Descriptors: *Kinetics, *Analysis, *Ammonia, *Activated carbon, Chemical reactions, Design criteria, Separation techniques, Nitrogen, Hydrogen ion concentration, Organic matter, Treatment facilities. Waste water treatment.

Chloramine-activated carbon stoichiometry and kinetics were studied to develop design criteria for effective ammonia removal in waste water treatment. Mono- and dichloramine were converted by surface reactions to nitrogen Monochloramine reacted by a parallel pathway to form ammonia and nitrogen gas, and steady-state reaction conditions did not coren gas, and stoichiometric to conversions Dichloramine reacted by a single pathway to produce only nitrogen gas. This pathway had a potential for 100% ammonia removal. The overall conversion of monochloramine and the parallel reactions to ammonia and nitrogen gas were described by a first-order kinetic model. Increases in pH were accompanied by decreases in the nitrogen gas production rate. The rate constant as-sociated with nitrogen production did not mea-sureably increase with time at any given pH. The dichloramine-carbon reaction also exhibited first-order, irreversible kinetics. The amount of dichloramine applied to the reactor as a measure of surface oxide accumulation was included in this model. Diffusional mass transfer had little effect on the monochloramine reaction rate, but was sig-nificant in relation to the dichloramine reaction. It was concluded that dichloramine-activated carbon reactions can provide effective nitrogen removal from waste water. Removals of BOD, suspended solids, phosphorus, and ammonia were expected eater than 95%. (Collins-FIRL)

SIGNIFICANCE OF TEMPERATURE IN THE ACTIVATED SLUDGE PROCESS, Toronto Univ., (Ontario).

K.-C. Lin. PhD Thesis, 1974.

PhD Thesis, 1976.

Descriptors: *Activated sludge, *Temperature, *Kinetics, *Sludge treatment, *Biochemical oxygen demand, Suspended solids, Regression analysis, Statistics, Effluents, Waste water treatment.

Statistical analyses of data collected from 13 waste treatment plants indicated that temperature plays an important role in the efficiency of the activated sludge process. The influence of temperature is second only to that of BOD5 and suspended solid concentrations in raw sewage. Greater percentages of removal, and lower concentrations in effluent, of BOD5 and suspended solids were observed at higher temperatures. The varability of temperature was observed to follow a sinusoidal curve over a 365-day period, with peaks at 30-day intervals, possible due to differences in organic loading. Variabilities of BOD5 and suspended solids were more random in nature. It was suggested that continuous temperature readings be taken for raw sewage and mixed liquor, and that mixed liquor temperatures be used instead of raw sewage temperatures for biokinetic studies. (Schulz-FIRL) W77-12142

BIOKINETICS OF LOW TEMPERATURE WASTE ASSIMILATION, Manitoba Univ., Winnipeg. B. H. Topnik.

Descriptors: *Kinetics, *Aeration, *Waste water treatment, *Temperature, Domestic wastes, Biochemical oxygen demand, Chemical oxygen demand, Nitrification, Oxygen, Ammonia, Nitrogen, Separation techniques, Model studies, Waste water treatment

Identifiers: Biokinetics, Kinetic growth, Substrate utilization, Laboratory studies.

The biokinetics of low temperature waste assimilation were studied. Investigations were performed with a 20 liter/day continuous-flow extended aeration unit at temperatures of 20-0C. Raw domestic sewage was used as the feed. Data on kinetic growth and substrate utilization were analyzed after steady state operation at a given temperature. Temperature and substrate concentration effects on growth and substrate utilization were unobservable after 261 days of testing. Average kinetic constants were given and overall BOD5 removals followed a zero-order relationship. Nitrification was evident at all temperatures. About 18% of feed ammonia nitrogen was oxidized to nitrate at OC. The oxygen uptake rate was temperature-dependent. High BOD5 and COD removal efficiencies at low temperatures were attributed to cellular food storage rather than to cell replication. Other test parameters supported this conclusion. (Collins-FIRL) W77-12143

5E. Ultimate Disposal Of Wastes

STUDIES ON APPEARANCE MECHANISM OF RICE PLANT DAMAGE BY IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
Tokai-Kinki National Agricultural Experiment

Tokai-Kinki National Agricultural Experin Station, Tsu (Japan). For primary bibliographic entry see Field 5B.

W77-11515

LET'S TALK RUBBISH PART 3: LITTER, For primary bibliographic entry see Field 5B. W77-11545 ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS, American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port, Control of Control of Control For primary bibliographic entry see Field 8G. W77-11595

ANAEROBIC DIGESTION OF SOLID WASTE AND SEWAGE SLUDGE TO METHANE, Environmental Protection Agency, Cincinnati, Ohio. Office of Solid Waste Management Pro-

grams. For primary bibliographic entry see Field 5D.

W77-11674

MECHANICAL SEWAGE SLUDGE COMPOST-ING - IN MIXER WITH RECYCLED BIOGENIC MASS CHARGING REVOLVING HEATED DRUM.

German Patent DS 2517-381. Issued March 3, 1977. Derwent German Patents Abstracts, Vol Y. No 10, p D3, April, 1977

Descriptors: *Patents, *Sludge treatment, *Waste disposal, *Recycling, Mechanical equipment, Heat treatment, Waste treatment, Waste water treatment.

Identifiers: Composting.

A patent was issued for a mechanical sludge com-A patient was issued to a mechanical studge composting process for sewage sludge and other semi-solid wastes. The sludge to be composted is premixed with recycled sludge compost according to a predetermined formula. The mixture is then added to a revolving drum which already contains rotting sludge compost. Optimum composting conditions are maintained. (Collins-FIRL) W77-11681

BIOLOGICAL CONTROL OF WATER POLLU-

Pennsylvania Univ., Philadelphia. Center for Ecological Research in Planning and Design. For primary bibliographic entry see Field 5G. W77-11690

PALO ALTO SEES GOLDEN GLINT IN SLUDGE.

For primary bibliographic entry see Field 5D. W77-11703

EXTENSIONS TO GREAT BILLING STW

For primary bibliographic entry see Field 5D. W77-11707

PROCESSING TO OPTIMIZE DIGESTIBILITY AND ENERGY PRODUCTION, Regional Wastewater Solids Management Program, Whittier, Calif. Laloma Project.

Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1713-1721, July, 1977. 6 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Anaerobic digestion, *Energy budget, *Model studies, Sludge treatment, Biodegradation, Disinfection, Odor, Dewatering, Activated sludge, Digestion, Waste water treat-

Identifiers: *Thermal conditioning, Sludge pretreatment

Previous studies on the improvement of anaerobic sludge digestion by thermal pretreatment have prefaced this investigation to verify and quantify the extent of increased biodegradability due to thermal conditioning. A method for thermal pretreatment and anaerobic digestion to improve degradability and increase energy production during the processing of primary and waste-activated sludges is described, in which residual heat from thermal conditioning is used to facilitate mesophilic or thermophilic digestion. To reduce odors, a significant problem in thermally treated sludges, the thermally treated sludge and liquor are not separated, but rather sent directly to a digestion tank. Energy balances were determined for various thermal treatment-anaerobic digestion systems. Energy production was highest for a system in which thermally treated sludge was combined with untreated primary sludge. Second highest in energy production was a system in which untreated primary and waste-activated sludges were used. The digested mixture in either case, however, would not be pathogen-free. A slight expenditure of energy to produce both ther-mally treated primary and waste-activated sludge would, however, result in a sterilized product. Further laboratory and field studies of the process are being conducted through the Regional Wastewater Solids Management Program (Laloma Project) for the Los Angeles-Orange County Metropolitan Area. (Schulz-FIRL) W77-11709

SLUDGE HANDLING.

Water and Wastes Engineering, Vol. 14, No. 7, p 10, July, 1977.

*Fertilizers, *Sludge disposal, Descriptors: *Heavy metals, *Soil-water-plant relationships, *Plant growth, Sludge treatment, Corn(Field), Agronomy, Waste disposal, Waste water treat-

Identifiers: Thermal conduction.

Municipal sewage sludge which has been thermally conditioned at an installation in Levittown. Pennsylvania has been successfully used for fertilizing and conditioning of two one-acre plots in the Portland, Maine area. Yields of corn crops grown on the plots were not appreciably different from control plots. Application of thermally conditioned sludge did not appear to result in excessive concentrations of heavy metals or other contaminants in plant tissues or groundwater. Sludge, with solids of 35%, was reported to contain more nitrogen and phosphorus and less potassium than cow manure. Other advantages to the use of thercow manure. Other auvantages to the use of their mally conditioned sludge include application with conventional farm equipment and possible storage over long periods of time without appreciable odor problems. (Schulz-FIRL) W77-11710

HYGIENIZATION OF SEWAGE SLUDGE BY ELECTRON IRRADIATION.

Brown Boveri Review, Vol. 64, p 180-186, March, 1977. 6 fig, 11 ref.

Descriptors: *Fertilizers, *Sludge treatment, *Irradiation, *Microorganisms, *Disinfection, Application methods, Waste water treatment, Sludy disposal, Sewage treatment, Tertiary treatment, Waste water treatment.

Hygienization of sewage sludge to remove infec-tious bacteria and parasites is often necessary be-fore treated sludge can be used for agricultural purposes. A method of hygienization utilizing elec-tron irradiation is described. After screening and homogenization, digested sludge is irradiated and passed into storage tanks for subsequent disposal. Irradiation is effective in reducing coliform bacteria and Salmonella, inhibiting future growth, and inactivating viruses. Physical characteristics of sludge are not adversely affected by irradiation, while coagulation and settling abilities may im-prove. Although fertilizing with untreated sludge is most effective, higher grain yields have been ob-tained with irradiated sludge than with sludge which has been subjected to steam pasteurization, the traditional method of hygienization. Operating costs indicate that electron irradiation as a method

of hygienization is economically viable when the amount of sludge produced is 250 to 400 cu m daily. (Schulz-FIRL) W77-11712

CHARACTERISTICS OF PERCOLATE OF SOLID AND HAZARDOUS WASTE DEPOSITS, Municipal Environmental Research Lab., Cincin-nati, Ohio. Solid and Hazardous Waste Research

D. R. Brunner, and R. A. Carnes. Journal of the American Water Works Association, Vol. 69, No. 8, p 453-457, August, 1977. 6 tab, 22 ref.

Descriptors: *Waste dumps, *Irrigation practices, *Landfills, *Waste disposal, *Environmental effects, Return flow, Sewage disposal, Underground waste disposal, Water pollution sources, Polychlorinated biphenyls, Heavy metals, Solid wastes, Municipal wastes, Percolating water, Waste water treatment, Industrial wastes.

Deleterious effects on groundwater and surface water of land disposal of municipal and industrial wastes have prefaced this review of waste disposal practices and percolates emanating from waste disposal sites. The nature and extent of land disposal problems are discussed with respect to the geographic distribution of waste, pollution control legislation, and the entry of waste contaminants into the hydrologic cycle. Common disposal methods considered include dumping, burial, and land application. Physical and chemical characteristics of percolates from municipal solid waste are described, including volumetric production, chemical composition, and the presence of pathogens and toxic organic compounds. Other hazardous wastes considered include arsenic, polychlorinated biphenyls, and heavy metals. (Schulz-FIRL) W77-11721

VISCOSITY EFFECTS OF SLUDGE.

Water and Waste Treatment, Vol. 20, No. 6, p 34, 36. June. 1977.

Descriptors: Physical properties, *Sludge treat-ment, *Pump testing, *Pumps, Sludge, Model stu-dies, Analytical techniques, Design criteria, Waste water treatment.

Identifiers: *Sludge viscosity, Sludge characteristics.

Research by BHRA Fluid Engineering, Cranfield, Bedford, United Kingdom, on the viscosity effects of sewage sludge on rotodynamic pump per-formance and pipline friction is described. BHRA in collaboration with the Water Research Center will also attempt to define limits of sludge solids concentrations for economical pumping and to correlate pump performance with sludge charac-teristics. A literature survey and on-site testing will be used in the evaluation program. (Schulz-FIRL) W77-11722

STANDING COMMITTEE ON THE DISPOSAL OF SEWAGE SLUDGE.

Water Services, Vol. 81, No. 976, p 335, 338, June,

Descriptors: *Sludge disposal, *Sludge treatment, *Incineration, *Waste disposal, Oceans, Water pollution, Land management, Fertilizers, Planning, Waste water treatment, Sewage pollution, Planning,

The Standing Committee on the Disposal of Sewage Sludge was set up in 1975 by the Department of the Environment and the National Water Council of the United Kingdom as part of a set of six standing technical committees. Because of the wide range of interests involved in the ultimate disposal of sewage sludge, four subcommittees

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were formed covering the areas of land disposal, were formed covering the areas of land disposal, sea disposal, air disposal (i.e. incineration), and economic aspects. The subcommittee on the disposal of sewage sludge to land initiated a survey on the means of disposal for different parts of England, Scotland, Wales, and Northern Ireland and determined that .75 percent of disposal was to land, 22 percent to sea, and 3 percent to incineration. The committee is examining the effects of land application of sludge on soil, crops, humans, and the environment through field studies. It is also conducting a literature survey on disposal. The sea disposal subcommittee reviewed the effects of sludge disposal by ocean dumping, existing methods of monitoring, and current research into ocean disposal. The incineration subcommittee surveyed existing sludge treatment plants using incineration as a means of disposal and suggested that the constituents of ash and be examined more closely. The economics subcommittee is collecting information on the economic constraints on disposal and is identifying networks of processes for treating and disposing of sewage sludge. The findings of each of the subcommittees will be evaluated with respect to all possible solutions before final recommendations are made. (Schulz-FIRL)

CURRENT SLUDGE RESEARCH AT THE WRC,

D. Mabey. Water Services, Vol. 81, No. 976, p 347-348, June,

Descriptors: *Activated sludge, *Sludge disposal, *Dewatering, *Anaerobic digestion, *Dewatering, *Oxygenation, Aeration, Oxygen requirements, Sludge digestion, Waste water treatment, Cost comparisons, Sludge treatment.

Current research on sludge treatment and disposal at the Water Research Center (WRC) at Medmenham, England is described. Increased aeration and supplemental oxygenation are suggested as methods of upgrading an activated sludge plant when existing facilities are no longer able to produce high-quality effluent due to increased loads. An evaluation of an oxygen injection system being used by the Welsh National Water Development Authority indicated that, in spite of higher operating costs and hazards associated with the use and storage of liquid oxygen, oxygen injection may be a viable alternative to aeration, particularly when needed on a short-term basis only. Aspects of sludge dewatering under investigation by the WRC include volume reduction by lowspeed centrifugation and the role that sewage depth plays in gravity dewatering. WRC is also attempting to define the controlling factors and sludge characteristics which influence sludge settleability. Anaerobic digestion is being considered for treatment of farm and food industry wastes. Quantification of sludge stability and standard costs indices for water and sewage disposal are being examined. Cost comparisons are being ware is also determining the fate and distribution of hazardous substances in sanitary landfills. A survey by the WRC of farmers using treated sludge for soil conditioning indicated that fertiliz-ing capabilities of land-applied sludge should be better defined. (Schulz-FIRL) W77-11741

THERMAL DRYING OF SLUDGE, Ercole Marelli S.p.A., Milan (Italy). M. Janelli.

Water Services, Vol. 81, No. 976, p 336-338, June, 1977. 4 fig.

Descriptors: *Dewatering, *Sludge treatment, Heat, *Centrifugation, Filtration, Waste water treatment, Sludge disposal, Separation techniques, Pilot plants, Model studies, *Drying. Identifiers: *Thermal drying, Thermal sludge dry-

Unpredictable variations in volume of sludge produced by mechanical methods of dewatering such as centrifugation or filtration have prefaced this investigation into thermal drying of sludge. In thermal drying, hot air of relatively low humidity absorbs moisture from sludge and loses heat in the process by an isenthalpic transformation. Thermal drying produces sludge with a water content from 25 to 50 percent, as opposed to 65 to 85 percent produced by mechanical drying. Additional energy requirements for the production of heat for thermal drying may be furnished by incineration of raw sewage or production of gas for fuel in digesters. The Item patented thermal drier uses high-velocity injection of hot air to produce a sludge aerosol, maximizing sludge-hot air contact by decreasing sludge particle size and increasing particle surface area. Operation tests indicated a thermal efficiency of between 65 and 67 percent for the Item thermal drier. A prototype sludge drier which has been in operation in Milan for 4 years has proved adequate for sludge drying requirements of a population of 10,000. (Schulz-FIRL) W77-11743

SEWAGE SLUDGE FOR AGRICULTURAL USE, Department of Agriculture, Washington, D.C. Public Information Office. R. G. Pierce.

Waste Age, Vol. 8, No. 6, p 6, 8-10, 114, June, 1977, 3 tab

Descriptors: *Sewage sludge, *Heavy metals, *Sludge disposal, *Fertilizers, *Absorption, *Soil-water-plant relationships, Plant growth, Toxicity, Zinc, Nitrogen, Lead, Cadmium, Copper, Soil chemical properties, Hydrogen ion concentration, Application methods, Soil treatment, Waste disposal, Sludge, Waste water treatment.

Problems associated with the land application of sewage sludge, and the need for regular monitoring of heavy metal and nutrient levels in sludge designated for land application, are discussed. Dangers associated with heavy metals such as zinc, copper, nickel, and cadmium include accumulation in the soil, toxicity to plants, and re-entry into the food chain through accumulation in plant tissue. Research by the USDA's Agricultural Research Service examines the controlling factors on the toxicity and uptake of heavy metals, including plant species, soil characteristics such as pH, and sludge application rates. Studies indicate that uptake is minimized at pH values above 6.5 and low concentrations of inorganic metal salts. The Agricultural Research Service recommends that, in addition to the USDA guidelines for maximum metal concentrations in land-applied sludge, soil pH should be adjusted and maintained at 6.5 or greater. Cadmium should not exceed 1.8 lbs/acre. and sludge should not be used to fertilize crops of leafy vegetables. A regular monitoring program is suggested for solids, total-N, inorganic-N, Zn, cu, Pb, Ni, and Cd. Concentrations of Se, As, Mo, Bo, Fe, Al, Hg, Ag, Ba, Co, S, and Na should also be established as sufficiently low before sludge appli-cation is considered. (Schulz-FIRL)

IS THERE A POTENTIAL FOR PARASITIC DISEASE TRANSMISSION FROM LAND APPLICATION OF SEWAGE EFFLUENTS AND SLUDGES

Pittsburgh Univ., Pa. Dept. of Life Sciences.

B. D. Hays.

Journal of Environmental Health, Vol. 39, No. 6, p 424-426, May-June, 1977. 15 ref.

Descriptors: *Animal parasites, *Pathology, *Diseases, *Sludge disposal, *Sewage treatment, Model studies, Sewage disposal, Environmental sanitation, Effluents, Fertilizers, Irrigation, Infection, Waste disposal, Waste water treatment.
Identifiers: Allegheny County(PA), Allegheny Identifiers: sburgh(PA).

The increased use of sewage treatment plant products for land application and irrigation has led to an evaluation of the fate and distribution of various protozoan cysts and metazoan eggs of human and animal intestinal parasites which can occur in sewage. A literature review includes a survey of parasitic species which have been observed in sewage in the United States. Studies on the survival of parasitic organisms showed that although reduced in number by sewage treatment processes, in particular anaerobic digestion, parasitic forms are not totally destroyed during any process. Sewage-related transmission of in-testinal diseases to humans or animals has, however, always been associated with raw or partially treated sewage. An examination of sludges collected from four treatment plants in the Pittsburgh, Pennsylvania area revealed some parasitic eggs in all samples, with the parasite species being related to the waste source. Greater attention to parasites in sludge and their potential for disease transmission is recommeded for land treatment and resource recovery programs. (Schulz-FIRL)

INACTIVATION OF POLIOVIRUS IN WASTE-WATER SLUDGE WITH RADIATION AND THERMORADIATION.

Sandia Labs., Albuquerque, N. Mex. For primary bibliographic entry see Field 5D.

CONCEPT, RESEARCH, APPROVAL...AN EF-FLUENT IRRIGATION PROJECT HOUGHTON LAKE SEWER AUTHORITY. Consulting Engineer, Vol 48, No 5, p 77, May,

Descriptors: *Marshes, *Irrigation, Food chains, Wildlife management, Planning, *Waste disposal, Organic matter, Nutrients, Treatment facilities, Costs, Waste water treatment.

A marshland irrigation system was proposed for the disposal of treatment plant effluents in Michigan. Two possible advantages were seen: an estimated cost savings of \$700,000 over the use of a conventional irrigation system, and improved food supply and wildlife proliferation in the marsh area. Because of the lack of data on wetlands irrigation in Michigan, a test program was con-ducted before project approval. The test area was evaluated through plant, soil, and insect samples and through water quality tests. The organic deposits proved excellent in nutrient removal without overloading, and no adverse effects were detected in the test program. The application of 12.5 million gallons of waste water during 1975 and 1976 continued to produce favorable results without adverse effects. The marsh ecosystem was not damaged, and plants grew larger and greener. The irrigation project was accepted as financially and environmentally feasible. (Collins-FIRL)

WATER RELATED UTILITIES FOR SMALL COMMUNITIES IN RURAL ALASKA, Corvallis Environmental Research Lab., College,

Alaska, Arctic Environmental Research Station For primary bibliographic entry see Field 5D. W77-11763

SECONDARY SEWAGE TREATMENT VERSUS OCEAN OUTFALLS: AN ASSESSMENT, Dartmouth Coll., Hanover, N.H. Dept. of Earth

C. B. Officer, and J. H. Ryther.

W77-11757

Science, Vol. 197, No. 4308, p 1056-1060, 9 September 1977. 1 fig, 1 tab, 26 ref.

Descriptors: *Sewage treatment, *Assessment, *Oxygen demand, *Eutrophication, *Water pollution control, *Coasts, Rivers, Estuaries, Mu-

nicipal wastes, Industrial wastes, Equations, Mathematical models, Systems analysis. Identifiers: *Ocean outfalls, *Marine environment, Order of magnitude, Waste oxidation model, Trace contaminants, Pathogens, Waste as-

Considered are simplified models to obtain order of magnitude estimates of the oxygen demand of municipal and industrial wastes and of their potential eutrophication effects in the marine environment. The models have been applied to assess two major corrective actions that might be considered for such pollution problems-secondary sewage treatment and ocean outfalls. It is concluded that the arguments for secondary sewage treatment as the proper corrective action are not compelling and that the problem should be reexamined with appropriate scientific and engineering evaluations. One goal should be a more thorough understanding of the life histories of possible trace contaminants and pathogens which may have long biological, chemical, or geological retention times in the marine environment. As opposed to secondary sewage treatment, ocean outfalls can virtually eliminate the eutrophication potential; in addition, the sewage nutrients can have the beneficial effect of serving as fertilizers for the aquatic food chain. W77-11766

TRACE METALS IN OPEN WATER DISPOSAL OF DREDGED MATERIAL,

University of Southern California, Los Angeles.

University of Southern Cantornia, Los Angeles. Environmental Engineering Program.
K. Y. Chen, J. C. S. Lu, and A. Z. Sycip.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No.
WW4, p 443-454, November 1976. 4 tab, 3 fig, 12

Descriptors: *Water quality control, *Waste water disposal, *Trace elements, *Metals, Water pollution, Dredging, Sedimentation, Sediments, tion, Dredging, Sedimentation, Sedim Analytical techniques, Standards, Sea water. Identifiers: *Spoil.

Upon addition of sediment/seawater mixture to the seawater column, most trace metals were found to display a pattern of immediate release.

These released metals were subsequently removed. The removal is gradually under reducing environments and almost immediately under oxidizing environments. The degree of release was significant for Fe, Mn, and Ni. The Ci, Cu, Pb, and An were moderately released. The release of Ag. Cd, and Hg was neglibible. After resedimentation, the migration of trace metals between sediment/seawater interface were found to be in-fluenced by the redox conditions of the overlying water. In general, three patterns of metal behavior were observed: (1) the release amount increased as the redox conditions became more reducing (Fe and Mn); (2) the release amount increased as environment became more oxidizing (Cd, Cu, Ni, Pb, and An); and (3) no significant release (Cr and Hg). The soluble metal concentrations during and after open water disposal of dredged materials were found to be in the range of sup-ppb to ppb with the exception of Fe, under reducing condi-W77-11780

FINAL ENVIRONMENTAL IMPACT STATE-MENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON

Environmental Protection Agency, Seattle, Wash.

For primary bibliographic entry see Field 5D.

LANDSAT OBSERVATIONS OF OCEAN DUMP PLUME MOVEMENT AND DISPERSION, Delaware Univ., Newark. Coll. of Marine Studies.

For primary bibliographic entry see Field 5B.

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY.

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Atmospheric Lab

For primary bibliographic entry see Field 5B.

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY REPORT.

National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center For primary bibliographic entry see Field 5C. W77-11899

TANKER SLUDGE REMOVAL AND DISPOSAL, Exxon International Co., New York; and Exxon Research and Engineering Co., Florham Park, N.

V. X. Lanotte, and J. E. Shewmaker.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 174. Price codes: A04 in paper copy, A01 in microfiche. Final Report No. MA-RD-940-76055 to U.S. Maritime Administration, Washington, D.C., June 1976. 50 p, 8 tab, 14 ref. C-5-38000.

Descriptors: *Sludge disposal, *Water pollution control, Oil pollution, Waste treatment, Incineration, Solid wastes, Separation techniques. Identifiers: Oil tankers, Tanker sludge, Crude washing. Tank cleaning.

The varied aspects of the problem of cargo tank sludge on crude carries in reported. A general description of the problem is given and the sludge management alternatives in selecting a strategy is scanned. Crude washing is briefly discussed as a combined removal and disposal technique. In-tank removal methods involving portable eductors and a vacuum clearner arrangement are described and conclusions are drawn from test results. Current and potential shore disposal methods are presented including sludge farming, incineration (also shipboard), oil extraction, chemical fixation, and aqueous extraction. (Sinha-OEIS) W77-11911

HEALTH HAZARDS OF AGRICULTURAL, IN-DUSTRIAL, AND MUNICIPAL WASTES AP-PLIED TO LAND, Universitaet Hohenheim (Landwirtschaftliche

Hochschule). (West Germany). Inst. of Animal Medicine and Animal Hygiene. For primary bibliographic entry see Field 5C. W77-11975

MICROBIAL CONCERNS WHEN WASTES ARE APPLIED TO LAND,

Agricultural Research Service, Lincoln, Nebr. North Central Region. For primary bibliographic entry see Field 5C. W77-11976

ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WASTES,

Agricultural Economics. For primary bibliographic entry see Field 5G. W77-11977 Oklahoma State Univ., Stillwater. Dept. of USING LIQUID POULTRY WASTES IN WOODLANDS,

Connecticut Agricultural Experiment Station New

G. R. Stephens, and D. E. Hill.

In: Proceedings of the International Conference on Land for Waste Management, Ottawa, Canada, Oct., 1973, p. 234-242. Department of the Environ-ment and National Research Council of Canada, 1974. 3 fig, 5 ref.

Descriptors: Application rates, Nitrates, Volitization, Liquid wastes, Groundwater, Nitrogen, Nitrification, Farm wastes. Identifiers: Poultry wastes, Land application, Woodlands, Tree response.

During 1970-1972, liquid poultry manure was applied to a plantation of white pine (Pinusstrobus L.) in order to: (1) determine the application rate that will neither damage the trees nor pollute the environment, and (2) determine the nutrient storage capacity in trees and soil. Applications to well-drained and poorly drained soils varied from 25 to 225 t/ha and contained 260 to 2,250 kg/ha N. Within two weeks of application, approximately 50% of the N. applied was volatized. Concentrations of NH4-N in the plots were dependent upon rate of application and season of the year. At low application rates, rapid conversion of NH4-N to NO-N or direct uptake of NH4-N by pine trees resulted in low soil concentration during the dummer. From December to May, nitrifivation rate decreased and NH4-N was increased. At the highest application rate, excess NH4-N was present throughout the year and was neither completely converted to NO3-N nor taken up by the trees. Nitrates not utilized by plants and soil organisms were subject to leaching. Nitrate levels in groundwater under all plots receiving 27-83 t manure were not objectionable, although NO3-N is poorly drained plot receiving 83 t manure reached 7.5 ppm in December, 1972, when the depth to groundwater was less than 1 m. Groundwater beneath the poorly drained plot that received 225 tons/ha in 1970 contained as much as 80 ppm NO3-N after 27 months. Foliage of untory conifer seedlings was damaged by 1 or 2 applications during the growing season; 5 applica-tions killed the seedlings. However, none of the larger trees were visibly injured. Utilization of available nitrogen by pine trees was evidenced by greening of the foliage within 7 months of application. On heavily manured plots, foliar nitrogen was increased as much as 58%. Manuring also increased needle weight and aided retention of older creased needle weight and alued retention of older needles. After 3 years, manuring doubled the rela-tive growth rates of the boles on the well-drained site but not on the poorly drained site. These stu-dies indicate that 1 ha of pine plantation will safely utilize on a sustained basis manure from 1,000 hens. (Merryman-East Central) W77-11979

RESIDUAL WASTE BEST MANAGEMENT PRACTICES: A WATER PLANNER'S GUIDE TO LAND DISPOSAL,

TO LAND DISPOSAL, Environmental Protection Agency, Washington, D.C. Div. of Water Planning. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-258 849, Price codes: A13 in paper copy, A01 in microfiche. Report WPD EPA-440/9-76-022, June 1976. 285 p, 26 fig, 46 tab, 4 append.

Descriptors: *Waste disposal, *Landfills, *Sludge disposal, *Water management(Applied), Costs, Water pollution sources, Industrial wastes, Mu-nicipal wastes, Farm wastes, Ultimate disposal, Underground waste disposal, Environmental ef-fects, Legal aspects, Management, Waste water

A handbook for waste disposal is presented to aid in decision-making in water quality management. Nine residual waste categories are discussed, in-cluding waste water sludge, septage residuals,

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water treatment, municipal refuse, combustion and air pollution control residuals, industrial wastes, feedlot residuals, mining wastes, and dredge spoil residuals. Quality, quantity, environ-mental effects, and compliance regulations are discussed for each waste category. Methods of ultimate waste disposal discussed include land application, waste reutilization, trench disposal, and cation, waste teutinzation, teitich usposai, audicocan disposal. Various technical and scientific aspects which may affect waste disposal decisions include climate, topography, groundwater infiltration and hydraulics, subsurface chemistry, and vegetation. Legal consequences of alternative residual waste management plans and waste disposal regulations are discussed. Planning processes necessary to develop an effective com-prehensive residuals management program are outlined and illustrated for a hypothetical example. Appendices to this report discuss field moni-toring and sampling, laboratory procedures for residual wastes, a site evaluation checklist for land disposal, and a glossary of related terms. (Schulz-W77-12076

A REVIEW OF TECHNIQUES FOR INCINERA-TION OF SEWAGE SLUDGE WITH SOLID

WASTES, Weston (Roy F.), Inc., West Chester, Pa. For primary bibliographic entry see Field 5D. W77-12081

SOLUBILITY AND AVAILABILITY OF CADMIUM IN CADMIUM-SLUDGE AMENDED SOIL, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 5B. W77-12144

THE EFFECTS OF WASTEWATER APPLICA TION ON THE GROWTH AND CHEMICAL COMPOSITION OF FORAGES.

Cold Regions Research and Engineering Lab. Hanover, N.H. A. J. Palazzo.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 774, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-39, p 1-8, October 1976. 8 tab, 9 ref.

*Waste Descriptors: water(Pollution). *Waste sanitation, *Forages, *Soil disposal, *Waste *Environmental management, *Waste water disposal, *Waste water treatment, Path of pollutants, Sewage disposal, Degradation(Decomposition), Recycling, Nitrogen, Growth rates, Forage grasses

The data presented were related to the capabilities of the vegetation in renovating land applications of wastewater. This information was useful when applied to the design and operation of a land treat-ment system. The results showed that the greatest forage yields and N and P removal occurred when 15 cm/wk (6 in/wk) of wastewater was applied. Forages grown on the heavier textured Charlton soils produced greater yields and removed more N and P than those grown on the lighter textured Windsor soils. Yields ranged from 9.63 to 12.99 metric tons/hectare (4.33 to 5.81 tons/acre), and total uptake of N and P ranged from 309 to 453 kg/ha (278 to 408 lb/acre) and from 32 to 42 kg/ha (29 to 38 lb/acre), respectively. Also included in the report were results which reflect on the management of a system for sustained plant per-formance and nitrogen removal. Analyses per-formed in 1974 and 1975 showed reductions in the levels of K in soil and forage, indicating a need for K fertilization for sustained forage productivity. The reduction of K was related to the uptake of this element by the forage and its low concentra-tion in the wastewater. Analyses also showed in the wastewater. Analyses also showed reductions in soil pH and total exchangeable ca-tions to levels which could be corrected by lime application. (Katz) W77-12198

5F. Water Treatment and **Quality Alteration**

DECONTAMINATING LAKE SUPERIOR OF

ASBESTOS FIBERS,
Army Mobility and Equipment Research and
Development Center, Fort Belvoir, Va.
For primary bibliographic entry see Field 5D.
W77-11539

PROGRESS OF STUDIES ON THE TYPE A (INFECTIOUS) HEPATITIS VIRUS IN WATER, National Inst. for Water Research, Pretoria (South

For primary W77-11571 mary bibliographic entry see Field 5A

STUDIES ON DISINFECTION AND CHEMICAL OXIDATION WITH OZONE AND CHLORINE IN WATER RECLAMATION.

National Inst. for Water Research, Pretoria (South

W. R. Ross, J. Van Leeuwen, and W. O. Grabow. Water SA., Vol. 2, No. 1, p 25-32, 1976. 6 fig, 2 tab, 34 ref.

Descriptors: Laboratory studies, *Chlorination, *Ozonation, Water reuse, Pesticides, Activated carbon, Filtration, Costs, Dieldrin, Parathion, Lindane, *Oxidation, *Chlorine, *Disinfection, Water Identifiers: South Africa.

Laboratory studies showed that Pseudomonas aeruginosa, Aeromonas hydrophila and Acinetobacter anitratum are more resistant to aeruginosa, chlorine and ozone than Escherichia coli. Pe domonas aeruginosa was the most resistant of all strains tested and was selected as test organism for pilot studies on the efficiencies of chlorine and ozone disinfection. The disinfectants proved equally efficient for the disinfection of chlorine demand-free water but ozone was much more efficient in the case of water with a chlorine demand. This difference was confirmed to be due to the property of chlorine to react with nitrogenous substances to form chloramines which are less efficient disinfactants than chlorine. Ozone does not share this property. Laboratory studies showed that ozone was highly efficient in the chemical ox-idation of the pesticides parathion, fenthion, lindane and dieldrin and the detergents Manoxol OT and LAS. These compounds are not oxidised under conventional conditions of chlorination. Consideration of the above findings and other advantageous and disadvantages of chlorine and ozone accentuate the value of using appropriate combinations of disinfactants for the treatment of certain waters. A final treatment sequence of ozonation, activated carbon filtration and chlorination may improve costs and efficiency of water reclamation. (So African Water Info Center)

HEALTH ASPECTS OF POTABLE WATER SUPPLIES,

National Inst. for Water Research, Pretoria (South

W. H. Hattingh, and E. M. Nupen. Water SA., Vol. 2, No. 1, p 33-46, 1976. 8 tab, 8 fig, 32 ref.

Descriptors: *Public health, *Potable water, Water reuse, Sewage treatment, Water quality standards, Bioassay, Waste water treatment, Water treatment. Identifiers: South Africa

A ten-year research programme to assess the chemical and microbiological quality of potable water, including water reclaimed from purified sewage effluents, has been started by the National Institute for Water Research of the South African

Council for Scientific and Industrial Research. This project involves a study of eight different but related aspects of water quality. The results ob-tained during the first two years of the investiga-tion are presented and discussed. These show that the quality of all potable waters tested to date, was excellent and that of reclaimed water was the same, if not better than potable water from surface sources. Those aspects needing further research are also indicated and centre around a knowledge of the pollutants present in the water environment. Pure chemical and microbiological assays will have to be supported by bioassaying techniques to assess the long-term effect of pollutants present in small concentrations. (So African Water Info Center) W77-11573

CHEMICAL TECHNOLOGY AND ECONOMICS IN ENVIRONMENTAL PERSPECTIVES: TASK REMOVAL OF BORON FROM WASTE-

Midwest Research Inst., Kansas City, Mo. For primary bibliographic entry see Field 5D. W77-11666

ENHANCEMENT OF HIGH-RATE DISINFEC-TION BY SEQUENTIAL ADDITION CHLORINE AND CHLORINE DIOXIDE, O'Brien and Gere Engineers, Inc., Syracuse, N.Y. For primary bibliographic entry see Field 5D. W77-11668

AIR BLOWERS FOR SEWAGE AND WATER TREATMENT. Water Services, Vol 81, No 976, p 344, June, 1977.

Descriptors: Equipment, *Aeration. *Oxygenation, Sewage treatment, Waste water treatment, Coagulation, Water treatment. Identifiers: *Air blowers, *Positive displacement

Positive displacement air blowers have been used in the activated sludge treatment process to supply oil-free air which is used to agitate the sludge, coagulate colloids, and provide oxygen for aerobic processes. Air is also used to back clean filters. Peabody Holmes Ltd. of Turmbridge, Hudder-stield, England has designed a rationalized series

of positive displacement blowers, which covers the volume and pressure range from 80 cu m/hr to 50,000 cu m/hr. Higher rotational speeds resulting from strong impellers have reduced from 66 to 26 the number of machines necessary to cover the volume and range. Mechanical noise levels have been reduced. Peabody Holmes air blowers also costain various servicing daytics including nutro. contain various protection devices including auto-matic power shut-off, vacuum switches, pressure switches, and thermostatically controlled heaters. (Schulz-FIRL)

EVALUATION OF RESIDUAL CHLORINE CONTROL SYSTEMS, Fischer and Porter Co., Warminster, Pa.

Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1591-1603, July, 1977. 19 fig, 2 tab, 6

Descriptors: *Chlorination, *Disinfection, *Automatic control, *Control systems, *Equipment, *Instrumentation, Monitoring, Chemcontrol, Chemical wastes, Water pollution sources, Costs, Model studies, Pilot plants, Electronic equipment, Waste water treatment. tronic equipment, Waste water treatment. Identifiers: *Residual chlorine.

The high economic and energy costs of chlorine and the environmental hazard posed by and the environmental hazard posed by overchlorination have made automatic control of residual chlorine in water and waste water treat-ment advantageous. Three systems for automatic

Water Quality Control—Group 5G

gas dispenser control are currently used, with the choice being controlled by flow signal present in the system. In studies to determine the actual chlorine demand of waste water, results indicated that most of the demand for chlorination was satisfied the property of the control of the control of the demand for chlorination was satisfied the property of the control of the contr satisfied during the first five minutes of contact time and that residual decay followed an exponen-tial function. Five strategies for automatic control of residual chlorine were investigated using a laboratory-scale chlorination system with a hypochlorite pump. An evaluation of two-mode, three-mode, sampling, two-timer, and cascade control systems indicated that there were no obvious advantages of three-mode (proportional band, reset, derivative) over two-mode control (proportional band, reset). It was determined that for performance purposes controller response time was more imporlant than the type of controller. Cascade control is suggested for residual control when the first sample point is 5 to 15 minutes downstream from the plant. Feedforward flow pacing is suggested to minimize differences between control methods. (Schulz-FIRL) W77-11708

EXPERIENCE WITH THE BACTERIOLOGICAL CONTROL OF WASTE WATER PURIFICATION (A SZENNYVIZTISZTAS BAK-TERIOLOGIAI ELLENORZESENEK TAPASZ-TALATAI),
For primary bibliographic entry see Field 5D.

W77-11725

INACTIVATION INACTIVATION OF VIRUSES DURING ANAEROBIC SLUDGE DIGESTION, Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 5D. W77-11737

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW), Wastewater Treatment.

Water and Wastes Engineering, Vol. 14, No. 7, p 9. July. 1977.

Descriptors: *Water resources, *Water reuse, *Tertiary treatment, *Deep wells, *Injection wells, Waste water treatment, Saline water intrusion, Sewage treatment, Reverse osmosis, Treatment facilities, Waste disposal, Water treatment.

An advanced waste water treatment facility designed to recycle waste water for municipal and industrial use has been constructed in Fountain Valley, California. The Orange County Water District had the facility built to provide an alternative to ocean disposal of waste water and to create a hydraulic fresh water pressure barrier to sea water intrusion. Treatment processes at Water Factory 21, which receives secondary treated sewage from the Orange County Sanitation District, include: coagulation and settling, ammonia removal, pH adjustment, filtration, carbon adsorption, adjustment, filtration, carbon adsorption, demineralization by reverse osmosis, and chlorination. Treated water is diluted and then undergoes deep well injection for storage. (Schulz-FIRI.) W77-11753

INSTRUMENTATION AND AUTOMATION EX-PERIENCES IN WASTEWATER-TREATMENT FACILITIES,

Raytheon Co., Portsmouth, R. I. For primary bibliographic entry see Field 5D. W77-11760

IMPACT OF WATER RESOURCES ON VEC-TOR-BORNE DISEASES, Center for Disease Control, Fort Collins, Colo.

For primary bibliographic entry see Field 5B. W77-11774

A FUNDAMENTAL STUDY OF REMOVAL MECHANISMS OF SUSPENDED PARTICLES IN THE DEEP FILTER (III) (KYUSOKU ROKAROSO NO KYODO (III): TEIJO ROKAJI NO RIHAKU TO SONO SAYO KIKO NO KENTO),

For primary bibliographic entry see Field 5D. W77-11829

THE USE OF POLLUTED SOURCES FOR

WATER SUPPLY, North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. D. A. Okun

APWA Reporter, p 23-25, September 1976.

Descriptors: *Potential water supply, *Potable water, *Water delivery, *Water costs, Management, Annual costs, Public health, Water treatent, Toxins, Viruses. Identifiers: *Dual water supply systems

One-third of the U.S. population draws its drinking water from contaminated sources. A breakdown in water treatment facilities may carry contaminated water to users. The potential hazards of conventional water supply systems include viruses and exotic chemical that are not neutralized by conventional treatment. Long term ingestion of levels of pollution may have negative health effects. Three approaches exist for protecting the public health: eliminate toxic substances at the source, eliminate toxic substances from waste streams, or avoid use of polluted sources for potable supplies. The last option would often requ dual water supply systems. The advantages of a dual system are: the demand on high quality iding would be relieved, the cost of prov polluted sources for nonpotable sources is less than the cost of developing new potable sources, and the risk of long term ingestion of contaminants and the risk of long term ingestion of contaminants is eliminated. Examples of places using or planning to use dual supply systems are presented. The annual costs for dual and conventional systems are compared. The need to integrate and regionalize water supply and water pollution control operations is examined in light of economies of scale and the protection of downstream sources. (Nessa-NC) W77-11858

PILOT PLANT EXPERIENCES IN DEMINERALIZATION OF SECONDARY EFFLUENT USING ELECTRODIALYSIS, Environmental Protection Agency, Cincinnati, Ohio.

For primary bibliographic entry see Field 5D. W77-11914

ELECTROCHEMICAL CHLORINE FLUX

National Bureau of Standards, Washington, D.C. For primary bibliographic entry see Field 5A. W77-11915

SEMIPERMEABLE MEMBRANES AND THE METHOD FOR THE PREPARATION THEREOF.

Department of the Interior, Washington, D.C. For primary bibliographic entry see Field 3A. W77-11918

REMOVAL OF TRACE COPPER IONS FROM

WATER, Department of the Interior, Washington, D.C. For primary bibliographic entry see Field 5D. W77-11919

EVALUATION OF POTABLE WATER AS A VEHICLE OF TRANSMISSIBILITY AND VIA-BILITY FOR HERPESVIRUS,

North Dakota State Univ., Fargo. Dept. of Virology and Pharmacology.

For primary bibliographic entry see Field 5B. W77-11935

RECURRENT PROBLEMS OF WATER SUPPLY IN MALTA, Dundee Univ. (Scotland).

For primary bibliographic entry see Field 3A. W77-11988

5G. Water Quality Control

OIL-SPILL DISPERSANT FOR MARINE POL-LUTION.

Public Health, Vol. 76, No. 12, p 374-375, December 1976.

Descriptors: *Oil spills, *Dispersants, Toxicity, Marine life, Spraying, *Pollution abatement, Beaches, Water pollution control. Identifiers: South Africa, Marine pollution.

The first specification for oil-spill dispersant for use in dispensing crude and fuel oil floating on sea water in harbours and on high seas, as well as for use in beach cleaning, has been finalized by the South African Bureau of Standards. These specifications lay special stress on dispersing efficiency, suitability for use in conventional spray equip-ment, and toxicity to marine life, Prohibited ingredients are benzenes, chlorinated hydrocarbons, phenols, creosols, free caustic alkalis, mineral acids, and solvents containing more than 3% aromatic hydrocarbons. 76 Cases of oil pollution at sea have been handled since the Department of Transport accepted responsibility for this task. Major problems were experienced with the following ships 'Wilstar' at Port Elizabeth, 'Oriental Pioneer' at Cape Town, 'Produce' at Duban, and 'Oranjeland' at East London. Aerial application of dispersants by means of helicopter is tested. Booms, pick-up, burning, sinking, absorbents, and dispersants as methods of treating off-shore oil slicks are discussed. (So African Water Info W77-11549

APPLICATION OF HERBICIDES THROUGH A MICROJET IRRIGATION SYSTEM, Citrus and Subtropical Fruit Research Inst., Nel-

spruit (South Africa). For primary bibliographic entry see Field 3F. W77-11558

SCIENTIFIC INFORMATION IN THE DECI-SION TO DAM GLEN CANYON, California Univ., Los Angeles. Inst. of Geophysics

and Planetary Physics.
For primary bibliographic entry see Field 8E. W77-11583

PRELIMINARY EVALUATION OF WATER QUALITY OF PROPOSED LAFARGE LAKE, KICKAPOO RIVER, VERNON COUNTY,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Effects Lab. For primary bibliographic entry see Field 5C. W77-11584

WATER VIELD CHANGES AFTER THE UR-BANIZATION OF THE CANON'S BROOK CATCHMENT, HARLOW, ENGLAND, University Coll., London (England). Dept. of

Geography.
For primary bibliographic entry see Field 4C. W77-11600

TRADITIONAL METHODS OF WATER PURIFICATION IN THE RIVERAIN SUDAN IN

Group 5G-Water Quality Control

RELATION TO GEOGRAPHIC SOCIOECONOMIC CONDITIONS, AND For primary bibliographic entry see Field 5D. W77-11620

AQUACULTURE,

New York Sea Grant Inst., Albany. O. W. Terry.

MESA New York Bight Atlas Monograph No. 17, New York Sea Grant Institute Atlas No. NYSSGP-AM-77-009, June 1977. 36 p, 11 fig, 2 tab, 2 map, 80 ref.

Descriptors: *Aquiculture, *Waste disposal, *Water quality control, Resources development, *Oysters, Dams.

Identifiers: *New York Bight, Mariculture.

The oyster industry, probably the earliest form of American aquaculture, has a long and important history in the various inshore waters adjoining New York Bight. With the introduction of modern technology the future of oyster production is now promising despite the industry's recent difficulties. Stricter environmental protection will sometimes work to constrain aquaculture as well as to promote it, but the overall balance promises to be favorable to the industry. The greatest long-term potential for Bight aquaculture probably lies in sharing worldwide progress toward novel hightechnology systems just now beginning to be seriously considered-offshore or open seammariculture. The Bight has unique advantages for aquaculture; the Bight's presently most intractable waste disposal problems may be con resources through recycling. (NOAA) W77-11665 converted into

PLANNING FOR URBAN STORMWATER CON-

Fell, Brusso, Bruton, and Knowles, Inc., Tulsa, Okla

W. J. Fell. Public Works, Vol 108, No 8, p 81-85, August, 1977. 4 fig. 2 tab.

Descriptors: *Unit hydrographs, *Rainfall-runoff relationships, *Watersheds(Basins), *Storm water, Hydrologic data, Duration Discharge(Water), Hydrograph analysis, Mathematical models, Runoff, Precipita-tion(Atmospheric), Storms, Water manage-ment(Applied), Waste water treatment, *Planning. Identifiers: Tulsa(OK).

The elements of hydrograph construction and the use of hydrographs are discussed with respect to storm water management and the Soil Conserva-tion Service (SCS) unit hydrograph. Hydrographs are graphical presentations of storm flow or discharge rates with respect to storm duration, with the unit hydrograph representing the flow from one inch of rainfall over the entire catchment area. The Soil Conservation Service (SCS) unit hydrograph relates ratios of discharge and time, the shape of the curve being determined by field observations from actual watershed flows. Applications of the unit graph in constructing discharge hydrographs for actual storms are discussed. A series of equations relating rainfall, peak discharge, time to peak, and runoff is presented. An area of 160 acres in Tulsa, Oklahoma is used in a numerical example for hydrograph construction. (Schulz-FIRL) W77-11669

THE INVESTIGATION OF SEWER NETWORKS BY COMPUTER,

London Borough of Hammersmith (England). Directorate of Engineering. L. A. Cook, and B. Lockwood.

Proceedings of the Institution of Civil Engineers, Part 2, Vol 63, p 481-494, June, 1977. 4 fig, 5 ref.

Descriptors: *Algorithms, *Computer programs, *Sewerage, *Storm runoff, *Hydrograph analysis, Hydrographs, Analytical techniques, Storm drains, *Sewers, Urban hydrology, Design criteria, Water management(Applied), Drainage systems, Pipes, Mathematical models, Waste water treatment.

Identifiers: Borough of Hammersmith, London, England, TRRL.

Computer-based algorithms have been used by the London Borough of Hammersmith to examine the area's sewer system. The Sewcheck suite of programs and the Transport and Road Research Laboratory (TRRL) method of hydrographic analysis were the major components of the evaluation program. TRRL as used in Hammersmith was modified to produce hydraulic gradients, provide line-printer output, characterize surcharge, allow for pipes with oval and circular cross-sections, accept input data in a more compact form than the original version, and minimize cost in operating the program. A series of flow charts is provided to illustrate program logic. Calculated individual and cumulative surcharge figures may be high because of program limitations on relaxation of pipes and storage of storm water. Dry weather flow velocity should be checked for all new additions to the sewer network. Recommendations for weir placement, pipe size, and pipe gradient based on peak flow are presented. The size and other charac-teristics of the network control operating costs for the hydrograph program, with a system of 110 pipes requiring 105,000 octal words of storage per run using a CDC 6600. (Schulz-FIRL) W77-11670

POTENTIAL VALUE OF TREATMENT OF URBAN STORMWATER, New South Wales Univ., Kensington (Australia).

School of Civil Engineering.

I. Cordery.
The Institution of Engineers, Australia, Vol CE 18, No 2, p 60-63, 1976. 2 fig, 4 tab, 9 ref.

*Urban runoff, *Storm Descriptors: *Water quality, *Tertiary treatment, *Settling basins, Suspended solids, Biochemical oxygen de-mand, Surface runoff, Water pollution sources, Model studies, Waste water treatment. Identifiers: Storm water treatment

Storm water quality was examined for two sites in Sydney, Australia, to examine the feasibility of storm water treatment. Flow rate, suspended solids, BOD, phosphate, and ammonia were mea sured for approximately 100 water samples col-lected from 13 floods within a catchment area. Analyses indicated that pollutant loads were highest during the 'first flush' of the storm and also tended to be higher during morning storms than afternoon storms. Laboratory studies on settling for from 4 minutes to 24 hours as a treatment method for storm water showed that suspended solids could be reduced by as much as 87% with a settling time of only 15 minutes. A comparison of estimated annual loads indicated that settling of urban runoff could produce effluent qualities similar to those produced by tertiary treatment but at a much lower cost. (Schulz-FIRL)

BIOLOGICAL CONTROL OF WATER POLLU-

Pennsylvania Univ., Philadelphia. Center for Cological Research in Planning and Design.
University of Pennsylvania Press, Philadelphia,
Pennsylvania. 1976. 340 p. J. Tourbier and R. W. Pierson, Jr. (ed.).

Descriptors: *Biological treatment, *Soil-water-plant relationships, *Potable water, *Waste water treatment, *Groundwater recharge, Artificial recharge, Municipal wastes, Model studies, Plant growth, Cycling nutrients, Marsh plants, Biochemical oxygen demand, Chemical oxygen demand, Absorption, Aerobic treatment, Color, Sewage treatment, Biocontrol. Identifiers: *Water pollution biocontrol.

A series of articles presented as part of an Interna-tional Conference on Biological Water Quality Improvement Alternatives comprises this review of waste water pollution and treatment methods, Biological methods for the treatment and reclamation of waste water discussed include land application, the use of vegetation in nutrient cycling, con-trolled eutrophication, and bacterial cleaning of sewer lines. Aquatic ecosystems and nutrient cycles are discussed with respect to waste water treatment. More efficient methods of waste water treatment which also result in groundwater recharge are considered. Various aspects of drinking water are discussed, including possible con-taminants, future supplies, and primitive treat-ment methods. (See W77-11691 thru W77-11695) (Schulz-FIRL) W77-11690

EXPERIMENTAL USE OF EMERGENT VEGETATION FOR THE BIOLOGICAL TREATMENT OF MUNICIPAL WASTEWATER IN WISCONSIN,

IN Wisconsin Univ., Oshkosh. Dept. of Biology. F. Spangler, W. Sloey, and C. W. Fetter. In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 161-171, 9 tab, 19

Descriptors: *Soil-water-plant relationships, *Pilot plants, *Cycling nutrients, *Plant growth, Biological treatment, Nitrogen, Phosphorus, Absorption, Marsh plants, Vegetation establishment, Marsh management, Model studies, Waste water treatment, Sewage treatment, Aerobic treatment, Biochemical oxygen demand, Chemical oxygen demand. Waste treatment. Identifiers: Seymour(WI), Bulrushes, Irises.

The use of a marsh and its associated vegetation in waste water purification has been investigated as economical method to reduce bacteria, nutrients, and organic compounds in municipal waste water. In laboratory studies on the use of iris (Iris versicolor), softstem bulrush (Scirpus variations, and hardstem bulrush (Scirpus acutus) grown in gravel-lined basins, removal from effuent of BOD, COD, O-PO4, total-P, and dissolved solids was investigated for 5-, 3-, and 1.5-day retention times. Retention in all beds, including the solid control of the solid control o ing the gravel control, resulted in reductions of 49-98% of BOD and COD. Significant reductions in total-P and O-PO4 were observed for all planted beds, with bulrushes being more effective at removal than irises. A pilot plant, employing ten plastic-lined, gravel-filled retention basins, showed that gravel-filled control ponds were as ef-fective at water purification as planted ponds. Retention times of as little as five hours resulted in significant reductions in BOD (87-92%), turbidity (77-91%), and coliforms (90-99.7%). Reductions of dissolved solids (0.3-9.5%) and total-P (5-25%) were not appreciable. It was suggested that water purification is actually caused by microflora on the growing media rather than the plants themselves. (See also W77-11690) (Schulz-FIRL) W77-11691

RENOVATION OF MUNICIPAL WASTE-WATER FOR GROUNDWATER RECHARGE

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. W. E. Sopper.

W. E. Supper: In: Blological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 269-282, 10 tab, 9

Descriptors: *Groundwater recharge, *Artificial recharge, *Soil-water-plant relationships,

*Absorption, *Biological treatment, Soil con-tamination, Soil chemical properties, Phosphorus, Nitrogen, Forests, Forest soils, Agronomy, Corn(Field), Forage grasses, Trace elements, Waste water treatment, Municipal wastes, Model

*Spray Identifiers: irrigation. University Park(PA).

Studies at the Pennsylvania State University were performed on the use of vegetative cover to sup-plement removal of waste water constituents by soil interactions. Treated effluent was used to son interactions. Treated efficient was used to spread-ingate forested areas and cropland for a period of 12 years (1963-1974) at a rate of 5 cm/wk. Samples of percolating water collected in agronomic areas at 120 cm soil depth indicated that phosphate had been consistently reduced by more than 98% and was not significantly higher than control values. Nitrate-nitrogen removal at this apcontrol values. Nurate-nitrogen removal at this ap-plication rate was not adequate for Public Health Service drinking water standards in corn-planted areas, but was sufficient in canary grass covered areas. Although phosphorus was effectively removed in forested areas, without harvesting of trees it was continuously recycled. Nitrogen reduction was variable in forested areas, with an apparent system collapse when application rates were increased by 50%. Soil analyses showed that pH and concentrations of exchangeable K, orpari and concentrations of exchangeable K, organics, and N were not affected by spray irriga-tion. However, Ca, Mg, Na, P, and B increased significantly while Mn decreased. Harvesting of crops showed removal efficiencies of 334% of the blied N, 230% of the applied P, and 280% of the blied K for corn silage crops and 145%, 143%, applied K for corn silage crops and 145%, 143%, and 130% for reed canary grass. One effect of spray irrigation was an annual groundwater recharge of from 10,300 cu m to 17,300 cu m per hectare irrigated. It was suggested that at an application rate of 5 cm/wk, 4 million liters of waste water could be disposed of on 52 hectares of land, using agricultural areas, recreation areas, and open space as available. (See also W77-11690) (Schulz-FIRL) W77-11692

THE POTENTIAL OF SUBMERSED VASCULAR PLANTS FOR RECLAMATION OF WASTE-WATER IN TEMPERATE ZONE PONDS,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

C D McNahh

In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson, R. R. Jr.), University of Pennsylvania Press, 1976. p 123-132, 8 fig.

Descriptors: *Pilot plants, *Aquatic plants, rescriptors: "Puot plants, "Aquatic plants, "Aquatic populations, "Biological treatment, Cycling nutrients, Soil-water-plant relationships, Absorption, Plant growth, Aerobic treatment, Nitrogen, Phosphorus, Trace elements, Model studies, Aleas, Wastawatas Lance and South Programmers, Model Studies, Aleas, Wastawatas Lance and South Programmers, Programme dies, Algae, Waste water treatment, Sewage treat-ment, Fish diets, Aquatic microorganisms, Waste treatment, Municipal wastes. Identifiers: East Lansing(MI), Submersed vascu-

Tertiary treatment of municipal waste water using submersed vascular plants in aerobic stabilization onds has been investigated by Michigan State ponds has been investigated by stillingary to university. An on-campus pilot system designed to treat 2 million gallons of sewage per day includes a primary treatment unit, an activated to the comprising 40 acres. sludge facility, four ponds comprising 40 acres, and 143 acres of land for spray irrigation. Growth of the larger, more easily harvested, submersed vascular plants in stabilization ponds was favored by aerobic conditions, temperatures above 10C, and high water clarity which is, in turn, related to high concentrations of algae-grazing zooplankton. The introduction of fish which fed on zooplankton resulted in clouding of the water through uncon-strained algae production. At a retention time of 28 days, harvested plants were reported to have concentrated 20-25% of the phosphorus, 50-70% of the nitrogen, 80-100% of the manganese, 20-30%

of the iron, 5-10% of the copper and zinc, and 1-3% of the cadmium, chromium, cobalt, and nickel present in the effluent. Ultimate removal of these elements does, however, require harvesting to remove waste-enriched plants. As some vegetation must remain in the pond during the winter to in-sure continuous crop production, plant degeneration which returns a portion of the wastes to the pond may limit total ultimate removal. (See also W77-11690) (Schulz-FIRL) W77-11693

MACROPHYTES AND WATER PURIFICA-

TION, Max-Planck-Gesellschaft fuer Zuechtung Forshung, Krefeld (West Germany). Limnological Research Group.

In: Biological Control of Water Pollution (ed. Tourbier, J. and Pierson, R. W., Jr.), University of Pennsylvania Press, 1976. p 109-123, 9 fig, 6 tab, 4

*Soil-water-plant relationships, siology, *Sewage treatment, Descriptors: *Plant physiology, *Sewage treatment, *Pathogenic bacteria, *Waste water treatment, Sludge treatment, Effluents, Plant growth, Model studies, Hydrogen ion concentration, Disinfec-tion, Coliforms, Salmonella, Waste treatment. Identifiers: Schoenoplectus lacustris, Phragmites

communis. Mentha aquatica, Juncus effusus, Macrophytes.

The growth of plants in substandard water and waste treatment products has been studied to determine to what extent plant growth is affected by suboptimal conditions and to what extent plants influence water, subsoil, and sludge characteristics. Changes in chemical absorption and uptake, morphology, physiology, and growth rate were related to both species and sewage type. Root secretions of certain aquatic plants such as Martha countries. Mentha aquatica, Acorus calamas, Juncus effusus, and Phragmites communis were observed to have disinfective properties, reducing E. coli, Enterococci, and Salmonella by as much as 90% after two hours contact time with sewage. Schoenoplectus lacustris neutralized acidic or alkaline sev The use of plants was suggested for the purifica-tion, reclamation, dewatering, and sterilization of sludge. The Max Planck Institute has made several recommendations on the use of plants in sewage treatment, including: use of inert planting material to encourage nutrient uptake from waste water, oxygenation of root areas by periodic draining or cascade construction, use of algicides, equal distribution of effluent over planting beds, periodic harvesting of stems, and use of additional chemical treatment if necessary to insure high effluent quality. (See also W77-11690) (Schulz-FIRL) W77-11694

THE PURIFICATION OF WASTEWATER WITH THE AID OF RUSH OR REED PONDS,

Federal Commission for the Ijsselmeerpolders, The Hague (Nederlands).

J. De Jong.

In: Biological Control of Water Pollution (ed. Tourbier, J., and Pierson 7. W., Jr.), University of Pennsylvania Press, 1976. p 133-139, 7 fig, 5 tab,

Descriptors: *Soil-water-plant relationships, *Sewage treatment, *Biochemical oxygen de-mand, *Infiltration, Chemical oxygen demand, Nitrogen, Phosphorus, Biological treatment, Plant growth, Model studies, Pilot plants, Aquatic popu-lations, Aquatic plants, Waste water treatment. Identifiers: Phragmites australis, Flevoland, Lake Yssel, Netherlands,

A pilot study conducted in the Netherlands on the use of rushes, reeds (Phragmites australis), and polypropene fibers to reduce BOD, COD, N, and P in sewage is described. Campground sewage was emptied into ponds which initially had a starshaped layout, later changed to a series of elongated ditches for ease in maintenance. Significant reductions of almost 100% in BOD, COD, and bacteria (MPN) for pond-retained influent were at-tributed to purification by soil infiltration and nutrient uptake by pond-dwelling organisms. A decrease in rate of removal in latter parts of the study was attributed to saturation of the organisms with respect to the measured parameters. Optimal purification was reported for retention times of greater than 10 days. In a comparison of Dutch treatment facilities, the pond detention purification method proved more effective and less costly than the use of trickling filters or the activated shudge process. (See also W77-11690) (Schulz-FIRL) W77-11695

USING WETLANDS FOR WASTEWATER TREATMENT.

For primary bibliographic entry see Field 5D. W77-11700

PROBLEMS IN IMPLEMENTING U. S. WATER

QUALITY GOALS,
California Univ., Los Angeles. Dept. of Geog-W. E. Westman.

American Scientist, Vol. 65, No. 2, p 197-203, March-April, 1977. 21 ref.

Descriptors: *Planning, *Federal Water Pollution Control Act, *Legislation, *Water pollution con-trol, *Water quality, *Water policy, Water pollution, Urban runoff, Storm water, Water pollution sources, Water pollution effects, Reclaimed water, Monitoring, Sea water, Trace elements, Metals, Fertilizer, Treatment, Costs, Water management(Applied), Waste water treatment, Waste water disposal.

Identifiers: National Commission on Water Quali-

Key elements and goals of the 1972 Federal Water Pollution Control Act Amendments (FWPCA), the degree to which these goals are reflected by the National Commission on Water Quality (NCWQ), and possible future strategies for implementation are evaluated. Factors which are thought to reduce the cost-effectiveness of implementaion policies are: assigning higher priority to the treatment of municipal and industrial wastes than to nonpoint sources of wastes, discouraging treatment of urban runoff, lacking optimal strategies for storm water treatment, and failing to rank pollution sources by severity. Criticisms were leveled at the current monitoring program for the lack of en-forcement, lack of distinction between point and nonpoint sources of pollution, inadequate storm water and groundwater monitoring, and insufficient staff to insure accurate reporting by dischar-gers. Technologies available for land application as an alternate means of ultimate disposal of sewage wastes are examined. Hindrances to the reclamation and reuse of waste water are summarized as public health uncertainties, historical or legal uncertainties, and revenue requirements. Regulations for the protection of coastal waters are considered inadequate from an ecological standpoint in not considering the food chain paths of various pollutants being dumped into the ocean. Suggestions for the future include the development of more cost-effective routes toward attaining the goals set forth by the FWPCA and NCWQ. (Schulz-FIRL) W77-11739

WATER QUALITY MANAGEME RESEARCH AND DEVELOPMENT AREAS, MANAGEMENT-Water Pollution Research Lab., Stevenage M. J. D. White.

The Public Health Engineer, Vol. 5, No. 3, p 72-75, May, 1977. 2 fig. 49 ref.

Group 5G-Water Quality Control

Descriptors: *Research and development, *Water quality, *Biochemical oxygen demand, *Treatment, *Filtration, Suspended solids, Treatment facilities, Model studies, Pilot plants, Nitrate, Costs, Design criteria, Activated sludge, Sewage treatment, Automatic control, Waste water treatment.

Current areas of research and development for im-Current areas of research and development for improved effluent quality and reduced costs are discussed with respect to practical water quality management. Methods for suspended solids removal, which generally results in the removal of BOD, include floculation and filtration by sand filters, microstrainers, pebble beds, and grass plots. As filter media require backwashing to prevent clogging, researchers in the United Kingdom and the United States are investigating air-water backwashing and the use of dual media as more efficient, more economical methods of backwashing. Dissolved air flotation, normally used for the treatment of drinking water, has been studied recently for removal of suspended solids from effluent. The use of anaerobic processes for removal of nitrate from secondary effluents is described as an alternative to the normal physico-chemical methods of nitrate removal. Alternate methods of sludge disposal, dewatering, and sta-bilization are considered as means of reducing costs while maintaining high effluent quality. Au-tomatic control systems employing sensory devices, central processing, and integrated moni-toring systems are discussed. (Schulz-FIRL) W77-11747

PLANNING FOR IMPLEMENTATION UNDER SECTION 208.

Environmental Protection Agency, Washington,

D. C.
W. C. Lienesch, and G. A. Emison.
Journal of the Water Resources Planning and
Management Division, Proceedings of the AmerManagement of Civil Engineers, Vol. 102, No. ican Society of Civil Engineers, Vol. 102 WR2, p 283-295, November 1976. 1 tab, 3 ref.

Descriptors: *Water quality, *Land use, Planning, Regions, Environmental engineering, Regulation, Water law, Wastewater treatment.

Identifiers: *Federal laws, Government agencies, Citizen participation.

Limited experience with the development of water quality management plans by the initial 208 agencies indicates that there are certain common problems and issues that are arising. Perhaps the most difficult of these is the establishment of implementable institutional arrangements and regula-tory programs, both of which will require action by local, state and Federal governments. In addition, the agencies are finding that their work on wastewater treatment alternatives is being conwastewater treatment alternatives is being con-strained, sometimes significantly, by ongoing facilites planning. Finally, it is also becoming ap-parent that overemphasis on sophisticated analyti-cal approaches, which is typical of many plans, will not be sufficient for plan implementation. More emphasis must be placed on the continual involvement of local and state decision makers, especially those who will affect the implementation of the plan. (Bell-Cronell) W77-11776

MATHEMATICAL MODELING OF TRANS-PORT PROCESSES IN AQUATIC SYSTEMS, Battelle Pacific Northwest Labs., Richland, Wash. For primary bibliographic entry see Field 5B. W77-11786

BIOLOGICAL EVALUATION OF BEST PRACTICABLE AND BEST AVAILABLE TREATMENT CONTROL TECHNOLOGY FOR PETROLEUM REFINERY WASTEWATERS, Oklahoma State Univ., Stillwater. Reservoir Research Center. For primary bibliographic entry see Field 5D. W77-11790

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS, General Electric Co., San Jose, Calif.

For primary bibliographic entry see Field 3E.

SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS, AME Technology, Inc., Lexington, Ky. For primary bibliographic entry see Field 6G. W77-11851

USER MANUAL FOR SEWER AND WATER AC-

COUNTS PROCESSING MODULE.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 898, Price codes: A08 in paper copy, A01 in microfiche. Prepared for U.S. Department of Housing and Urban Development, Washington D.C., Report USAC-RPA2-4042A, May 1975. 143 p, 3 append. H-1212.

Descriptors: *Data storage and retrieval, *Data processing, *Computer programs, Data collections, Documentation, Data transmission, Automation, Computer models, Sewers.

Identifiers: *Municipal Information System,

*Sewer and water accounts.

The Urban Information Systems Inter-agency Committee (USAC) commissioned the City of Reading, Pennsylvania to develop a physical and economic development (PED) subsystem for a comprehensive municipal information system This report explains how to use the sewer and Into report explains now to use the sewer and water accounts processing (SWAP) module of the PED subsystem. It describes the responsibilities of the various bureaus and offices, and the forms used for collecting input to the module. Appendix A contains samples of the input forms that are described in the text. Appendix B contains the instruction forms for executing the nine SWAP module programs. The SWAP module includes those operations that secure information on individual accounts, update changes in this informa-tion, determine volume of customer usage, produce water and sewer bills, receive payment accounts, and maintain account status. The SWAP module includes the following operational uses: applications processing, meter reading, cash receipts, billing, and reporting. Implementation of this module will provide a foundation for a thorough city property data base, and substantial clerical hours will be saved in processing the sewer and water bills. Components of the USAC Information System are designed for use in regional information systems anywhere in the U.S. (Nessa-W77-11856

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POL-LUTION CONTROL ACT AMENDMENTS. V. P. Wilson.

Environmental Affairs, Vol. 5, p. 545-566,

Descriptors: *Water law, *Legal aspects, *Judicial decisions, *Federal Water Pollution Control Act, *Groundwater, Regulation, Common law, Legisla-tion, Water pollution, Injection wells, Navigable waters.
Identifiers: *Safe Drinking Water Act of 1974.

The study evaluates statutory and common law remedies for ground water pollution. Common law actions are available only to plaintiffs who own the land damaged by ground water pollution. The plaintiffs must prove negligence, nuisance or trespass, and that a causal link exists between the damages and the pollution. Statutory remedies in-clude the Safe Drinking Water Act (SDWA) of 1974 and the Federal Water Pollution Control Act (FWPCA) of 1972. The major provisions and limitations of both acts are summarized. The FWPCA seems to be the best remedy since the applicability of the SDWA is statutorily limited. A recent federal district court decision in the case of United States v. GAF Corporation raises serious questions as to the applicability of the FWPCA to questions as to the application of the FWFCA of groundwaters. The court's reasoning is evaluated and arguments are developed for the inclusion of groundwaters within the protection of the FWPCA. The Court's interpretation of the Act's legislative history is questionable. Injection wells, except for those expressly excluded, are part of the definition of point sources in the FWFCA. The FWPCA definition of navigable waters has been interpreted in other decisions as including groundwater. It is concluded that the GAF decision is in error. (Nessa-NC) W77-11863

THE ROLE OF SILICA AND THE VERNAL DIATOM BLOOM IN CONTROLLING THE GROWTH OF NUISANCE ALGAL POPULA-

TIONS IN LAKES,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5C.
W77-11864

WATER AND SEWER RATES IN MINNESOTA, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6C.
W77-11868

MOSQUITO CONTROL IN THE AQUATIC EN-VIRONMENT WITH MONOMOLECULAR OR-GANIC SURFACE FILMS, Naval Research Lab., Washington, D.C. Chemical

Oceanography Branch. W. D. Garrett.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD/A-028 077, Price codes: A02 in paper copy, A01 in microfiche. Laboratory Report No. 8020, July 16, 1976. 17 p, 4 fig, 5 tab, 17 ref.

Descriptors: *Air-water interfaces, *Monomolecular films, *Mosquitoes, *Aquatic environment, Mortality, Ecosystems. Identifiers: Surface films, Anopheles quadrimacu-latus, Aedes aegypti, *Mosquito control.

The lifestyle of immature forms of the mosquito in water is highly dependent upon the properties of the air-water interface. Nonionic monomolecular organic films, which reduce surface tension and increase the wettability of breathing structures, produced high cumulative mortalities and mortali-ty rates in fourth-instar larvae of Anopheles adrimaculatus. The mechanisms by which the film-induced surface affects the life cycle of the mosquito are discussed. Optimum properties of film-forming materials for practical mosquito-control applications are itemized and related to chemical structural considerations. The applicability and limitations of this approach to mosquito control are reviewed. (Sinha-OEIS)

VLCC 'METULA' OIL SPILL, Texas A and M Research Foundation, College Sta-

R. W. Hann, Jr.

R. W. Hann, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-03
805, Price codes: A04 in paper copy, A01 in
microfiche. Prepared for U.S. Coast Guard Office
of Research and Development Final Report No.
CG-D-54-75, December 1974. 69 p, 11 fig, 1 tab, 5
append. DOT-CG-42444-A.

Descriptors: *Oil spills, *Oil pollution, *Environmental effects, *Water pollution control, Beaches, Birds, Aquatic animals, Pollution abate-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Identifiers: *Outer Continental Shelf, Chile, Straits of Magellan.

On 9 August 1974, the METULA, a 206,000 dead-weight VLCC (Very Large Crude Carrier) enroute from Ras Tenura, Saudi Arabia to Quintera Bay, Chile with a load of 195,673 tons of Arabia light crude, ran aground on the Satellite Patch Shoal in the Straits of Magellan, Chile. The author was detailed by the U.S. Coast Guard to proceed to the spill site to serve in the capacity of Science Advisor to the U.S. National Strike Force sent to assist the Chilean government abate the spill. The report summarizes the history of the spill, the deposition of oil on the shore, impact of the oil on the shore, and comments regarding feasibility of containment, cleanup or stabilization. (Sinha-OFIS) W77-11889

SOCIAL COST OF OIL POLLUTION,

Naval Postgraduate School, Monterey, Calif.

H. S. Mudiiardio.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD/A-027 257, Price codes: A04 in paper copy, A01 in microfiche. Master's Thesis, March 1976. 67 p, 10 fig, 17 reg, 2 append.

Descriptors: *Oil pollution, *Oil spills, *Economics, *Water pollution effects, *Baseline studies, Resources development, Environmental effects, Damages, California.

Identifiers: Outer Continental Shelf. *San Francisco Bay.

A method of improving decision making relative to the problems created by oil spillage is investigated. This thesis uses a simulation to consider the spread and damage caused by oil spills using data from San Francisco Bay. A projection of social costs from these spills has been made. Formulation of a methodology for deriving the social cost of oil spills is a prerequisite in reaching optimal, rational decisions in managing oil pollution. Such decisions may include the establishment of a fine structure, determination of the required level of clean-up and identification of socially significant spills. (Sinha - OEIS) W77-11892

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER -DECEMBER, 1975. INTERPRETATIONS, Alabama Development Office, Montgomery. For primary bibliographic entry see Field 6E. W77-11900

SIGNIFICANCE OF LOW MOLECULAR WEIGHT HYDROCARBONS IN EASTERN GULF WATERS,
Texas A and M Univ., College Station. Dept. of

Oceanography.
For primary bibliographic entry see Field 5B.
W77-11902

SEPARATION OF OIL IN BILGE WATER BY SEMIPERMEABLE MEMBRANE,

Naval Ship Research and Development Center,

Annapolis, Md. W. L. Adamson, and M. W. Titus.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A023 289, Price codes: A03 in paper copy, A01 in microfiche. Report No. 7-580, May 1971. 26 p, 6 fig, 3 ref, append.

Descriptors: *Oil pollution, *Separation techniques, *Membrane processes, Semipermea-*Separation ble membranes, Water quality control, Water pol-lution treatment, Filtration, Equipment. Identifiers: Bilge water, Flux rates.

The oil-separation characteristics of celluloseacetate membranes were experimentally analyzed with a bench-scale apparatus. Experiments were initially conducted on distilled water solutions to determine permeate (product water) flux rate through the membrane as a function of operating time when the feedwater contained minimal impu rities. A group of membrane separation experiments were then carried out with distilled water and 1% 2190-TEP lubricating oil. For the oil/water tests, the change in permeate flow rate with time and the oil concentration of the permeate, the feedwater, and the waste water were measured. The results of the oil-water tests showed that the oil concentration could be reduced from 10,000 to less than 25 parts per million in a single pass through the membrane. The primary difficulty was a gradual decrease in permeate flux rate that resulted from the membrane becoming coated with an oil film. (Sinha-OEIS) W77-11909

TANKER SLUDGE REMOVAL AND DISPOSAL, Exxon International Co., New York; and Exxon Research and Engineering Co., Florham Park, N.

For primary bibliographic entry see Field 5E. W77-11911

OIL/WATER SEPARATOR EVALUATION. Naval Coastal Systems Lab., Panama City, Fla. T Mittleman

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A013-210, Price codes: A04 in paper copy, A01 in microfiche. Informal Report No. NCSL-252-75, July 1975. 56 p, 16 fig, 3 append.

Descriptors: *Oil pollution, *Oil spills, *Separation techniques, Oily water, Water pollu-tion treatment, Water pollution control, Equip-

Identifiers: Ballast water, *Oil-water separators.

A coalescing plate type oil/water separator, rated at 1000 gallons per minute was investigated during the period from January through November, 1974. An attempt was made to evaluate its performance in the context of oil spill clean-up operations by running a test series involving seawater and Navy Special Fuel Oil. This series myoung seawater and many Special Fuel Oil. This series was terminated in July when it became apparent that the test configuration was responsible for the formation of a 'permanent' water in oil emulsion. Then the separator's evaluation as a potential tool for implementation of the proper deadlinesting of Naval china was menting in-port deballasting of Naval ships was performed using contaminated Navy Distillate and seawater contained aboard tow sludge barges. The theory and operation of the separator are described. In the testing in the shore-based debal-lastor contest tow important design requirements are relaxed: a free surface is permissible since no ship motion is encountered, and the range of oils to be separated does not include heavy oils since these are not products normally carried by Naval vessels. (Sinha - OEIS) W77-11912

OIL/WATER SEPARATION WITH NONCELLU-LOSIC ULTRAFILTRATION SYSTEMS,

Naval Ship Research and Development Center, Annapolis, Md. P. Schatzberg, L. R. Harris, C. M. Adema, D. F. Jackson, and C. M. Kelly.

Available from the National Technical Informa-

tion Service, Springfield, VA 22161 as AD-A008 315, Price codes: A03 in paper copy, A01 in microfiche. Report for Program Element 62765N, April 1975. 18 p, 13 fig, 13 ref, 3 append.

Descriptors: *Oil pollution, Oily water, Water pollution treatment, Water pollution control, *Separation techniques, Membrane processes, rgents, Filtration.

Identifiers: Ballast water, *Ultrafiltration, *Oil-

In accordance with current efforts for environ-In accordance with current efforts for environ-mental protection, oily wastewater generated aboard ships will require treatment before discharge. One of the several processes being in-vestigated is ultrafiltration, a pressure-driven membrane process. Satisfactory separation of oil from water has been achieved using cellulose-acetate-type membranes, however these mem-branes exhibit hydrolytic instability and tempera-ture sensitivity. Now several different ultrafiltrature sensitivity. Now several different ultrafiltration membrane systems have been experimentally examined for their capability to separate emulsified and suspended oil from water. The active separation surfaces were noncellulosic, being either inorganic or orgainc polymer types. configu-rations studied were tubular, spiral-wound, hol-low-fiber, and plate-and-frame. Ultrafiltration rates (fluxes) were observed to vary significantly among the different systems. Although membrane cleaning (with or without detergent) could recover part of the flux decline, an irreversible cumulative fouling occurred. Detergent cleaning of the mem-branes was found to be a time-consuming procedure and disposal of detergent flush and rinse water presents a problem. (Sinha - OEIS) W77-11913

LIGHTWEIGHT END CONNECTORS FOR POLLUTION CONTAINMENT BOOM, J. J. Gallagher.

U.S. Patent No 4,008,575, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1094, February 22, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water quality control, Barriers, *Water pollution control, Floating, Equipment. Identifiers: Containment, Floating pollution bar-

riers. Connectors.

In connecting oil boom elements, there is a requirement that the means for carrying out the connection be fluid tight, quick, simple and durable so that the boom elements may be readily interconnected under adverse conditions. There is also an essential requirement that the means be resistant to damage from the diverse forces, dangers and misuses encountered in the marine environment. This invention provides a connector having a tongue-in-groove joint formed such that the resultant transverse force components generated in the joint by tension load between the elements are directed inwardly toward one another thereby reducing the requirement for the joint to resist large transverse movements in bending. A durable boom element connector is made out of a flexible or deflectible material which is resistant to permanent deformation under abusive or accidental overloading or misapplication of loads during use. (Sinha-OEIS) W77-11925

LIMNOLOGICAL STUDIES OF THE ISLAND AREA OF WESTERN LAKE ERIE,

Ohio State Univ., Columbus. For primary bibliographic entry see Field 2H. W77-11926

THE EFFECT OF INCREASED REGULATION ON A NORWEGIAN LAKE, (IN NORWEGIAN), Zoologisk Museum, Oslo (Norway).

R. Borgstrom. Fauna (Oslo). 26(3), p 190-197, 1973.

Descriptors: "Regulation, Lakes, "Trout, "Mortality, "Water levels, Turbidity, Fish migration, Fish diets, "Fish food organisms. Identifiers: "Lepidurus arcticus, *Norway(Marvann Reservoir).

Increased lowering of the water level of Marvann, a Norwegian high mountain reservoir, during the winter 1969/70 resulted in an especially low water level the following summer together with an increase in turbidity. The yield of trout fell almost to

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zero in the following years, probably due to increased mortality, increased migration to the inlets and a decreased immigration. The most important food item of trout before 1969, Lepidurus arcticus almost disappeared from the diet of trout in 1970/71 and in 1972the amount of L. arcticus in the stomach contents of trout was still much less than in the years previous to the increased regulation. The reasons for the disappearance of L. arcticus are discussed. Copyright 1974, Biological Abstracts, Inc. W77-11931

CHANGES IN AQUATIC MACROPHYTES AC-COMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA,

Cornell Univ., Ithaca, N.Y. Center for Environmental Research.

For primary bibliographic entry see Field 5A. W77-11940

ANIMAL WASTES MANAGEMENT, Utah State Univ., Logan. Coll. of Engineering. E. J. Middlebrooks Public Works, p 67-69, Feb., 1975.

Descriptors: Water pollution, Legal aspects, *Feed lots, Agricultural runoff, Nitrogen, Phosphorus, *Farm wastes, Waste treatment. Identifiers: Waste management, Manure spread-

Increased efficiency of agricultural production, and the influx of suburbia into rural areas has increased the recognition of the problems generated by handling and disposing of agricultural wastes. Proper planning and appropriate legislation is needed to strike a balance between adequate food production and proper waste management. Animal waste management would be simpler if the waste were to be collected in feedlots. But small beef and dairy cattle feeding operations, and poultry farms are scattered in relatively isolated areas, the majority along small streams. Many use the streams as a means of disposing of their wastes, causing pollution of our waterways, deplete the oxygen supply and add excessive quantities of nitrogen and phosphorus. Manure spreading is practiced by small animal farms, but as the size of these farms increases, it necessitates hauling the excess manure to other disposal sites or attempts to sell the manure as a soil conditioner, with little success. It is known that the impact on the water quality caused by animal wastes is due to the periodic sludge discharges of pollutants that reach a waterway. A number of feedlot runoff control measures, such as diversion, retention ponds, confinement, proper location, use of evaporation ponds, and land disposal of the excess liquid. (East Central) W77-11970

THE IMPLICATION OF HYDROGEOLOGIC FACTORS IN WASTE MANAGEMENT ON LAND (WITH SPECIAL REFERENCE TO THE NOVA SCOTIA ENVIRONMENT), Department of the Environment, Halifax (Nova

Scotia). Water Planning and Management Div. J. F. Jones, and J. E. Gibb.

In: Proceedings of the International Conference on Land for Waste Management, Ottawa, Canada, Oct., 1973, p 147-160. Department of the Environ-ment and National Research Council of Canada, 1974. 6 fig, 1 tab, 19 ref.

Descriptors: Hydrogeology, *Canada, Water pol-lution, Groundwater, Sewage lagoons, *Farm wastes, Waste treatment. Identifiers: Nova Scotia, Waste management.

The importance of hydrogeologic factors in waste management must be revealed to the public and to the planners of waste management systems in order to minimize environmental pollution. Ignorance of the implications of such factors has often resulted in groundwater and surface water pollution from such sources as leachate from septic tanks, industrial sewage lagoons, farm animal waste, and solid waste disposal sites.
Hydrogeologic factors of particular importance
for the protection of groundwater and surface
water in Nova Scotia include the groundwater flow systems, groundwater recharge and discharge areas, geology, topography, seasonal and climatic factors, the influence of pumping wells, etc. A continuing program of collection of hydrogeologic data should be maintained in Nova Scotia so that this information will be not all the continuing program of collection of hydrogeologic data should be maintained in Nova Scotia so that this information will be not all the continuing the continu this information will be available to the ap-propriate agencies. These data should be reduced so that they can be understood by non-hydrogeologists. Blanket regulations regarding waste disposal site locations are inadequate. Since conditions vary from area to area, an on-site hydrogeologic investigation is needed to determine the suitability of a given area for waste disposal. (Merryman-East Central) W77-11971

INFILTRATION CHARACTERISTICS FROM ANAEROBIC LAGOONS

New Zealand Agricultural Engineering Inst., Lincoln.

For primary bibliographic entry see Field 5B. W77-11974

ECONOMIC POTENTIAL AND MANAGEMENT CONSIDERATIONS IN LAND APPLICATION OF BEEF FEEDLOT WASTES, Oklahoma State Univ., Stillwater. Dept. of

Agricultural Economics.

D. D. Badger.

In: Land as a Waste Management Alternative, Proceedings of the 1976 Cornell Agricultural Waste Management Conference, Ann Arbor Science Publishers Inc., Ann Arbor, Michigan, 1977, p. 727-742. 5 tab, 13 ref.

Descriptors: *Land application, Cattle manure. Identifiers: *Feed lots, Nutrients, *Economic Legal aspects, Water pollution sources, Farm wastes. *Application rates.

New guidelines related to reducing water pollution from nonpoint sources are being implemented for Section 208 of PL 92-500, the Federal Water Pollution Control Act Amendments of 1972. The way these Section 208 regulations are implemented will have a significant impact on future application of both solid and liquid beef feedlot wastes to crop and pastureland. Recently, farmers have returned more and more to feedlot wastes as a source of nutrients. High fertilizer prices have made use of feedlot wastes more economically viable. While manure nutrients are highly variable, farmers realmanure nutrients are highly variable, farmers realize that manure use provides additional benefits. Moisture intake and water-holding capacity of sandy and loam type soils is improved. Texture or tithh of soil is improved. The appearance or 'richness' of light-colored tight soils is improved. Problems resulting from manure use have been compaction of soil due to large, heavy trucks that deliver and sarred manure slower rate of applicadeliver and spread manure, slower rate of application compared to commercial fertilizer application, the necessity of working the field one to two times more to incorporate manure into soil, uneveness of application, imbalance in ratio of nutrients applied relative to soil needs, increased salinity, and introduction of weeds. In the Oklahoma and Texas panhandle areas, a general rule of thumb for manure application has been that manure may be applied safely for several consecutive years at 10 tons/acre/year. Most farmers surveyed in the panhandle areas were convinced that the nutrient value of beef feedlot wastes was sufficiently high to pay the current rate of \$3.00 to \$3.50 per ton of to pay the current rate of \$3.00 to \$3.30 per ton of manure. Engineering design and economic feasibility studies are needed to determine more efficient methods of storing, transporting and applying beef feedlot wastes, to retain a higher percentage of the nutrients for cropland use than is now the case. There appears to be a real need for some research on how to measure the trade-offs involved as well as to find mutually acceptable solu-tions for cropland utilization of manure and for minimizing runoff to comply with Section 208 of PL 92-500. (Merryman-East Central)

EPA WILL USE KSU MODEL AS WASTE SYSTEMS TOOL.
Kansas Farmer, V. 113, No. 20, p. 39, Nov. 20, 1976

Descriptors: *Computer models, Feed lots, *Water pollution, Watersheds(Basins), Agricultural runoff, Design, Management, Rain, Snow, Model studies, *Farm wastes.

The Environmental Protection Agency has given Kansas State University a \$108,556 grant as a first Ransas State University a \$100,550 grain as a trist step in EPA's program to develop a complete water quality index for feedlots—an index which will show what pollutants are in the water, where the water goes, and what effects pollutants might have on the environment. Kansas State University scientists are developing a computerized watershed model to predict the effects of rain and snow on the waste runoff from feedlots. The model will be used by EPA to evaluate waste control systems of feedlots. KSU research may also be helpful in designing new cattle feedlots. By using a computerized model, a representation is given of how different systems might work. This would be a definite boon in selection the best design for particular feedlots. (Merryman-East W77-11978

WATER AND DEVELOPMENT IN SAUDI ARABIA,

Durham Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 4B. W77-11991

EFFECT ON IRRIGATION WATER QUALITY, SULFURIC ACID AND GYPSUM ON PLANT GROWTH AND ON SOME PHYSICAL AND CHEMICAL PROPERTIES OF PIMA SOIL, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering

For primary bibliographic entry see Field 3C. W77-11998

NITROFURAZONE FOR CONTROL OF THE MICROSPORIDAN PARASITE PLEISTOPHORA OVARIAE IN COLDEN

Oklahoma Cooperative Fishery Research Unit. Stillwater.

M. L. Nagel, and R. C. Summerfelt. The Progressive Fish-Culturist, Vol. 39, No. 1, p 18-23, 1977. 2 fig, 6 tab, 12 ref.

Descriptors: *Fish physiology, *Mode of action, *Fish parasites, *Shiners, *Protozoa, *Fish parasites, *Shiners, *Protozoa, *Microbiology, Animal pathology, Path of pollutants, Reproduction, Fish populations, Organic compounds, Bioassay, Bactericides, *Fish dis-

Identifiers: *Golden shiners, *Pleistophora ovariae, *Nitrofurazone, Notemigonus crysoleucas, Bioaccumulation, Tissue analysis.

In a test of the efficacy of nitrofurazone to control infection of the Microsporidan parasite Pleistophora ovariae in ovaries of golden shiners riessophora ovariae in ovaries of golden shiners. (Notemigonus crysoleucas), the chemical was fed at levels of 1.10, 1.65, 2.20, 3.30, 5.51, and 7.71 g active ingredient per kilogram of feed (50-350 g/100 lb.). The dosage response was nonlinear; maximal drug effect on incidence of infection was at a dose of 2.20 a not maximal affact at instance. at a dose of 2.20 g and maximal effect on intensity of infection was at 3.30 g. The net production of shiners (not evaluated at the three highest treatment levels) was reduced in a pond in which the fish were given the 2.20 g treatment, suggesting that high levels of this drug may inhibit gonad development. None of the dosages tested yielded a complete cure. (Klein) W77-12082

CONTROL OF EXTERNAL BACTERIAL IN-FECTIONS OF BLUEGILLS WITH POTASSIUM PERMANGANATE, Auburn Agricultural Experiment Station, Ala.

Auburn Agricultural Experiment Station, Ala. Dept. of Fisheries and Allied Aquacultures. R. P. Phelps, J. A. Plumb, and C. W. Harris. The Progressive Fish Culturist, Vol 39, No 3, p 142-143, 1977. 1 tab. 11 ref.

Descriptors: *Sunfishes, *Potassium compounds, Fish physiology, *Mortality, *Bactericides, *Fish diseases, *Copper sulfate, Copper compounds, Dissolved oxygen, Bacteria, Bioassay, Research and development, Organic compounds, Microbiology.

Microfiology.

Midentifiers: *Bluegills, *Diuron, *Potassium permanganate, Bacterial infection control, Tissue analysis, Aeromonas sp., Flexibacter sp.

The efficacy of copper sulfate, Diuron, and potassium permanganate in controlling external bacterial infections of bluegils (Lepomis macrochirus) was determined. Potassium permanganate at 3 mg/l significantly reduced mortality whereas other concentrations and the other chemicals did not. Dissolved oxygen was reduced significantly in the pools treated with Diuron. (Klein) W77-12024

CHLORINATED COOLING WATERS IN THE MARINE ENVIRONMENT: DEVELOPMENT OF EFFLUENT GUIDELINES.

Woods Hole Oceanographic Institution, Mass.
J. M. Capuzzo, J. C. Goldman, J. A. Davidson, and
S. A. Lawrence.

S. A. Lawrence. Marine Pollution Bulletin, Vol. 8, No 7, p 161-163, 1977. 1 fig, 13 ref.

Descriptors: *Entrainment, *Toxicity, *Chlorine, *Respiration, *Water cooling, *Chlorination, *Mortality, *Regulation, Powerplants, Lobsters, Water quality standards, Larval growth stage, Juvenile growth stage, Killifishes, Bioassay, Laboratory tests, Analytical techniques, Metabolism. Identifiers: *Sublethal effects, *Chloramine, *Chlorine residuals.

The effects of free chlorine and chloranie on stage I lobster larvae and juvenile killifish were investigated in continuous flow bioassay units. In comparing mortality and changes in standard respiration rates during and after exposure to either chlorine form, significant respiratory stress was observed with exposure to sublethal levels. Sublethal responses to free and combined chlorine should be considered when establishing regultions for chlorine residuals in cooling waters. (Katz) W77-12036

TANNIN AS AN AGENT TO ELIMINATE AD-HESIVENESS OF WALLEYE EGGS DURING ARTIFICIAL PROPAGATION,

Southeastern Senior Coll., Juneau, Alaska. Div. of Fisheries.

D. L. Waltemver.

Transactions of the American Fisheries Society, Vol 109, No 6, p 731-736, 1977. 3 fig, 16 ref.

Descriptors: *Perches, *Walleye, *Fish reproduction, *Growth stages, *Fish eggs, Mode of action, Fish physiology, Mortality, Organic compounds, Laboratory tests, Fish farming, Aquiculture. Identifiers: Survival rates, *Tannin, Artificial propagation, *Stizostedion vitreum, Hatching success.

Tanin has been used to decrease adhesiveness of walleye (Stizostedion vitreum) eggs for the purpose of shortening the water-hardening phase of walleye propagation. In this study, adhesiveness of fertilized walleye eggs decreased after exposure to tannin concentrations between 200 and 1,000 mg/liter. Reduction in adhesiveness was generally proportional to tannin concentration and exposure time. Adhesiveness was further reduced and eliminated in higher tannin concentrations by stirring the eggs during a 2-minute exposure. Hatching success of nontreated (control) eggs averaged 37 and 47 percent whereas hatching success of tanin-treated eggs averaged 38 and 50 percent for 1974 and 1975, respectively. A 2-minute exposure at tannin concentrations ranging from 400-1,000 mg/liter would expedite artificial propagation and could enhance egg survival. (Katz)

OPTIMIZATION AND EVALUATION OF A FLUORESCENCE OIL SPILL DETECTOR. VOLUME 2 - PROTOTYPE DESIGN, Baird-Atomic, Inc., Bedford, Mass. For primary bibliographic entry see Field 5A. W77-12145

DEVELOPMENT OF A HIGH SEAS OIL RECOVERY SYSTEM, PHASE II PROTOTYPE DESIGN, FABRICATION, AND TESTING, Ocean Systems, Inc., Reston, Va.

R. L. Beach, F. A. March, L. S. Brown, T. S. McMahon, and J. Papp. Available from the National Technical Information

Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-003 933, Price codes: A03 in paper copy, A01 in microfiche. U.S. Coast Guard Report No. CG-D-84-74, June 1973. 104 p, 5 fig, 3 append. DOT-CG-22651-A.

Descriptors: *Oil pollution, *Water quality control, Water pollution, *Pollution abatement, Equipment.

Identifiers: *Outer Continental Shelf, *Oil recovery.

This Phase-II report covers design, construction, and test of a prototype 2000gpm oil recovery system for the high seas. A similar 1/3 scale system is described in Phase-I report. The prototype system consists of a weir/basin assembly, transfer and control system, and auxiliary equipment which includes a handling system, packaging system, and a flotsam fence. The transfer system has four hydraulic-motor-driven gear pumps, a 300-ft. hydraulic umbilical, an oil-water interface sensor array, and a remote-control system. The report describes subsystems tests, component assembly, air transport capability, and a complete oil-recovery test in a pool at Battelle Northwest, Richland, Washington. Pool tests utilized light and heavy fuel oils in calm water and 2 foot waves, with tow speeds to 2.76 knots. System performance nearly met predictions obtained from 1/3 scale model testing (Phase I). Efficiency (% of oil in recovered fluid) exceeded 80% for oil depths over 9 inches in the basin. Recovery rates up to 2000 gpm are possible with light oil. These rates are projected for viscosities up to 6000 ssu. (See also W77-01236) (Sinha - OEIS)

A PLAN FOR A NATIONAL COASTAL WATER QUALITY MONITORING NETWORK. Interstate Electronics Corp., Arlington, Va. Environmental Engineering Div. For primary bibliographic entry see Field 4C. W77-12147

CALLAHAN RESERVOIR: I. SEDIMENT AND NUTRIENT TRAP EFFICIENCY, Agricultural Research Service, Columbia, Mo. North Central Watershed Research Center. D. L. Rausch, and J. D. Schreiber. Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 2, p 281-284, 290, March-April 1977. 2 fig, 3 tab, 10 ref.

Descriptors: *Reservoirs, *Sediments, *Nutrients, *Missouri, *Trap efficiency, Sedimentation, Water pollution, Phosphorus, Nitrogen, Runoff, Inflow, Discharge(Water), Path of pollutants, Lakes.
Identifiers: *Callahan Reservoir(MO).

Small reservoirs remove and trap significant amounts of sediment and nutrients from storm runoff. Callahan Reservoir, a small flood-detention reservoir in central Missouri, which permanently stores 1 cm of runoff from its 1,440-ha drainage area, trapped an average of 87% of the incoming sediment, 72% of the total phosphorus (P), and 30% of the inorganic nitrogen (N) in 1973. Sediment efficiency and P trap efficiency in the reservoir were both related to the incoming sediment particle-size; however, only sediment trap efficiency was related to detention time. The annual amount of NO3 trapped seemed related to annual runoff volume. For 1973, the soluble nutrients, total soluble P, and NO3 were trapped at similar rates, 32% and 34%, respectively. More NH4, dissolved organic P and dissolved hydrolyzable P were found in outflow than in inflow. The increases, which are less than 2% of the nutrient budget, may be attributed to biological activity in the reservoir. (See also W77-12150) (Sims-ISWS) W77-12150)

CALLAHAN RESERVOIR: III. BOTTOM SEDI-MENT-WATER-PHOSPHORUS RELATION-SHIPS

SHIPS, Agricultural Research Service, Durant, Okla Water Quality Management Lab. A. Olness, and D. Rausch.

Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 291-297, 300, March-April 1977. 6 fig, 3 tab, 38 ref.

Descriptors: *Reservoirs, *Bottom sediments, *Water quality, Sediments, Chemical properties, Chemical analysis, Physical properties, Cores, Sampling, Phosphorus, Nutrients, Water chemistry, Lakes, Limnology.

Identifiers: *Callahan Reservoir(Mo).

Sediment core samples obtained from a 164,000 cu m reservoir in central Missouri showed highly significant correlations between sediment clay content and phosphorus concentrations. Both sediment clay content and phosphorus concentrations increased with distance from the reservoir inlet. No strong correlations between phosphorus concentration and sediment depth were observed. Phosphorus concentrations varied widely between and within core profiles ranging from less than 100 ppm to more than 1000 ppm and from less than 200 ppb to more than 3000 ppb for total phosphorus and total soluble phosphorus, respectively. The mean total phosphorus concentration in the reservoir water was 108 ppb. About 25% and 10% of the total suspended phosphorus was soluble phophorus and soluble reactive phosphorus, respectively. The adsorption or planktonic and mineral sedimentation. (See also W77-12144) (Sims-1SWS).

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies. M. R. Greenberg, and R. M. Hordon.

Pulgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies.

M. R. Greenberg, and R. M. Hordon.

Water Resources Bulletin, Vol. 12, No. 4, p 669-680, August 1976. 3 fig, 3 tab, 12 ref. OWRT C-114(No. 1583)NI(6).

Descriptors: "Water requirements, "Potable water, "Water supply, "Linear programming, Simulation analysis, Economics, Optimization, Costs, "New Jersey, Mathematical models, Equa-

Group 5G-Water Quality Control

tions, Systems analysis, Planning, Water demand, Regional analysis. Identifiers: Cost minimization.

The relative economic costs of meeting projected public potable water demands through increasing the supply, controlling the demand, and increasing the capacity for interagency water transfers are explored. These alternaives and combinations are evaluated, with the aid of a linear programming model, for the years 1975 to 2000 in northeastern New Jersey, a major metropolitan region of over 4.5 million people. After more than 30 model tests, it has been found that a combination of increased interagency transfers and added water supplies is the least expensive solution. (Bell-Cornell) W77-12159

MICHIGAN DIVERSION-STREAM QUALITY PLANNING, Metropolitan Sanitary District of Greater Chicago,

B. Macaitis, S. J. Povilaitis, and E. B. Cameron. Water Resources Bulletin, Vol. 13, No. 4, p 795-805, August 1977. 4 fig.

Descriptors: *Lake Michigan, *Diversion, *Water quality, *Planning, *Streams, *Projections, Computer models, Simulation analysis, Water supply, Water allocation(Policy), Dissolved oxygen, Rivers, Mathematical models, Systems analysis. Identifiers: *Discretionary diversion, *Pollution loads, Capital improvements, Drainage basins,

By United States Supreme Court action, the diversion of water from Lake Michigan and the Lake Michigan Drainage Basin in the Metropolitan Chicago Area is regulated at an annual maximum rate of 3,200 cfs. Approximately 1,700 cfs of this diversion is used for water supply, and the remaining 1,500 cfs consists primarily of stormwater runoff with lesser amounts of direct lake diversion, such as lockage and leakage, navigational makeup water flows, and discretionary diversion needed to maintain water quality standards in the Metropolitan Sanitary District of Greater Chicago's basic waterways. In order to assess the schedule of its discretionary diversion needs, the District, using a computer model of its basic waterway system, has calculated the minimum discretionary diversion requirements for projected water quality conditions as successive elements of the District's water pollution control program are completed. The results of these analyses can be used as a basis for developing plans for future allocations of the limited supply of Lake Michigan water to other uses such as domestic water supply, when and if such supplies become available. (Bell-Cornell) W77-12163

AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT OF URBAN

RESOURCES, Utah Water Research Lab., Logan. R. Narayanan, B. C. Jensen, and A. B. Bishop. Water Resources Bulletin, Vol. 13, No. 4, p 691-708, August 1977. 4 fig, 7 tab, 13 ref.

Descriptors: *Water allocation(Policy), *Economic efficiency, *Linear programming, *Recycling, *Optimization, Water supply, Water quality, Standards, Effluents, Constraints, Pricing, Algorithms, Municipal water, Planning, Feasibility, Waste water treatment, Utah, Regions, Equations, Mathematical models, Systems analysis

Identifiers: *Separable programming, *Urban water management(Policy), Constant elasticity demand, 'Lambda formulation', Surplus maximization. Cost minimization.

A separable programming approach to water management is proposed to determine economi-cally efficient urban water resource allocation and

pricing policy by maximizing the sum of the consumer and producer surplus. The optimization is accomplished utilizing a linear programming al-gorithm. The feasibility of using recycled water for municipal purpose is examined in a planning context. The impact of higher water quality discharge standards on pricing and allocation of water is analyzed and the attractiveness of water reuse option is demonstrated. Results of the application of the technique to Salt Lake County Utah are presented. Through use of the approach described herein, urban water management policies are derived which are economically efficient, that is (a) total cost is minimum at the quantity supplied, (b) marginal cost equals price, and (c) quantity demanded equals quantity supplied. Model results in-dicate the suitability of the separable programming approach to analyzing problems with nonlinear de-mand and cost functions and to utilizing standard linear programming algorithms for solution procedure. (Bell-Cornell)

REGIONAL MANAGEMENT OF URBAN AND AGRICULTURAL POLLUTION, Windsor Univ. (Ontario).
R. S. Lashkari, C. L. Hwang, and L. T. Fan.
Journal of the Water Pollution Control Federation, Vol. 49, No. 8, p 1877-1888, August 1977. 6 fig, 6 tab, 13 ref.

Descriptors: *Water quality control, *Salinity, *Biochemical oxygen demand, *Economic efficiency, *Water policy, *Optimization, *Drainage area, Costs, Constraints, Water demand, Agriculture, Utah, Standards, Desalination plants, Irriga-tion, Equations, Mathematical models, Systems

Identifiers: *Utah Lake drainage area, *Regional planning, Urban water, Agricultural wastes, Improvements, Cost minimization, Cost effectiveness, Balance equations.

Presented is an approach to water quality manage-ment in areas where a variety of urban and agricultural pollutants are discharged into a body of water. The Utah Lake drainage area is considered in which the urban and agricultural return flow from four districts of the Utah Valley are discharged into the Lake. A model of salinity and biochemical oxygen control is used which coor-dinates the pollution control activities of the urban and agricultural sectors in each district. The model consists of a wastewater treatment system and a desalting plant in the urban sector, and a combination of structural and practice improvements in the irrigation system of the agricultural sector. The objective is to minimize the costs of maintaining certain biochemical oxygen demand and salt reduction standards in the districts' aggregate effluents to the Lake under two assumptions: that each district is to maintain the standards independently, and that the salinity-biochemical oxygen demand control efforts of the individual districts are re-gionally coordinated. The results indicate that savings can be achieved through regional coor-dination of pollution control efforts. (Bell-Cornell)

INTENSIVE BREEDING OF CARP IN A CLOSED WATER CIRCULATION SYSTEM, INTENSIVHALTUNG VON KARPFEN IM GESCHI.OSSENEN KREISLAUFSYSTEM, Battelle-Institut e.V., Frankfurt am Main (West

Germany).
U. Muller, W. Schonborn, and G. v. Sengbusch.
Archiv fur Fischwissenschaft, Vol. 27, No. 1, p. 1-8, 1976. 5 fig, 7 ref.

Descriptors: *Methodology, *Fish farming, Fish populations, *Carp, *Fish management, *Fish reproduction, Design, *Growth rates, *Denitrification, Aquiculture, Waste treatment, Research and development, Nitrates, Nitrites. Identifiers: *Closed water circulation system.

Intensive breeding of fish in closed water circulation systems required a most effective treatment of the recirculated water to prevent autointoxica-tion of the system. A system with a special denitrification stage was proposed in which nitrate remains below 100 mg/l and nitrite below 1 mg/l even n case of a closely packed fish stock. Op-timum conditions provided, carp with a weight between 500 and 1000 g showed a growth rate of more than 30 percent per month and a feeding valued of less than 2.5. (Katz)

NEW YORK'S MARINE FISHERIES: CHANG-ING NEEDS IN A CHANGING ENVIRONMENT, New York State Dept. of Environmental Conservation, Stony Brook. Div. of Marine and Coastal For primary bibliographic entry see Field 6B. W77-12247

6. WATER RESOURCES **PLANNING**

6A. Techniques Of Planning

DETROIT AND ST. CLAIR RIVER TRANSIENT

National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
F. H. Quinn, and J. C. Hagman.

NOAA Technical Memorandum ERL GLERL-14, June 1977. 49 p, 15 fig, 3 tab, 3 ref, 2 append. Also as: GLERL Contribution No. 106.

Descriptors: *Mathematical models, Water resources, *Flow rates, Michigan, Great Lakes, *River flow River flow. *Detroit River(Mich), *St. Clair River(Mich).

A series of hydraulic transient models have been developed for the St. Clair and Detroit Rivers to simulate hourly and daily flow rates. These flows are necessary for water quantity and quality stu-dies of the Great Lakes. This memorandum describes the mathematical models, their calibra-tion, sensitivity, and applications. (NOAA) W77-11659

NONLINEAR MULTILEVEL MODEL FOR REGIONAL WATER RESOURCES PLANNING, Khonkaen Univ. (Thailand). Faculty of Engineer-

ing. S. Pratishthananda, and A. B. Bishop. Water Resources Bulletin, Vol. 13, No. 3, p 611-625, June 1977. 6 fig, 19 ref.

*Water resources, *Regional *Planning, *Water alloca-Descriptors: development, *Planning, *Water alloca-tion(Policy), *Waste water treatment, *Water supply, Optimization, Management, Treatment facilities, Computer programs, Algorithms, Equa-tions, Water costs, Mathematical models, Systems

analysis.

Identifiers: *Nonlinear programming, *Cominimization, *Multilevel analysis, Transportation matrix, Conjugate gradient projection method, Salt Lake County(Utah).

A nonlinear multilevel transportation model is developed to study large-scale allocations in a water resources system. The model uses a modified transportation matrix formulated with nonlinear cost functions as the basic subregional model and the goal coordination method for multilevel decomposition and optimization of the overall regional system. The objective function is to minimize the total cost of water supply and wastewater treatment for the system, subject to constraints on water source availabilities, water use requirements and facility capacities, system

continuity, exported water less than or equal to external (import) requirements, and imported water not to exceed supplies available for export. The model is applied to projected water requirements for Salt Lake County in 1985. Sources of water supply-surface water, groundwater, import water, and reuse of reclaimed wastewater on a restricted basis--are available to satisfy water requirements for municipal, industrial, and agricultural sectors in four subregions. The conjugate gradient projection method is used to optimize the first level subregional models having cost functions of the form of C = aX, and the second level problem is solved using the conjugate gradient method. (Bell-Cornell)
W77-11772

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT, Vrije Universiteit, Amsterdam (Netherlands).

Dept. of Economics. P. Nijkamp, and J. B. Vos.

Water Resources Research, Vol. 13, No. 3, p 513-518, June 1977. 6 tab, 26 ref.

Descriptors: *Water resources development, *Land use, *Alternative planning, *Projects, Evaluation, Design, Land reclamation, Equations,

Systems analysis.
Identifiers: *Multicriteria analysis, Concordance analysis, Satisficing, Intangibles, Netherlands.

A new variant of the concordance analysis is developed and discussed herein. The concordance procedure, in general, is a multicriteria evaluation method for alternative projects. It is based on a pairwise comparison of (weighted) project out-comes, and it can be used both as an elimination method for less desirable projects and as a selec-tion method for good projects. The new variant introduced is based on the idea of satisficing (or norm) project outcomes, which may serve as a frame of reference for the evaluation techniques. Such satisficing outcomes are also important in at-tacking the dimensional problems of a multicriteria is. The new concordance variant is illustrated by means of an empirical application to the selection of the most desirable plan from a series of alternatives for the development of the Markerwaard area in the Netherlands. It is concluded that the concordance analysis is a useful tool in taking account of intangibles in water resource and land use design. (Bell-Cornell) W77-11773

NEW GROWTH CENTERS-A ROLE FOR THE BUREAU OF RECLAMATION, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.

For primary bibliographic entry see Field 6B. W77-11775

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DIS-

TRICT,
Florida Univ, Gainesville. Dept. of Environmen-

tal Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-11859

SHORT COURSE PROCEEDINGS - APPLICA-TIONS OF STORMWATER MANAGEMENT MODELS, 1976,

Massachusetts Univ. Amherst. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-265 321, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/2-77-065, March 1977. Edited by F. A. DiGiano, et. al. 434 p, 80 fig, 41 tab, 176 ref.

1

Descriptors: *Mathematical models, *Federal Water Pollution Control Act, *Storm water, Model studies, Water management(Applied), Storm runoff, Planning, Management, Urban runoff, Legislation, Cities, Waste water treatment. Identifiers: Storm water management, SWMM, STORM, FILTH, USLE.

This short course, held in Chicago, Illinois on July 18-23, 1976, focused on the role of mathematical models and simulations in storm water management. The U.S. EPA Storm Water Management Model (SWMM) is discussed in detail. Applica-tions of other models, including FILTH, STORM, and USLE, are also considered. Topics discussed in the eleven papers presented include cost assessments for storm water management planning pro-grams; a description of program blocks, data requirements, and capabilities of SWMM; various criteria for the selection of storm water manage ment models; methods for proper collection of field data for model input; and sample applications of model use. (See W77-12075) (Schulz-FIRL) W77-12074

SENSITIVITY ANALYSIS IN AQUIFER STU-

Stanford Univ., Calif. School of Earth Sciences. For primary bibliographic entry see Field 4B.

MICHIGAN DIVERSION-STREAM QUALITY PLANNING. Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 5G. W77-12163

AN OPTIMIZATION MODEL FOR EFFICIENT MANAGEMENT OF URBAN RESOURCES,

Utah Water Research Lab., Logan. mary bibliographic entry see Field 5G. For primary W77-12165

SIMULTANEOUS INVESTMENT AND ALLO-CATION DECISIONS APPLIED TO WATER PLANNING,

Texas Univ. at Austin R. D. Armstrong, and C. E. Willis.

Management Science, Vol. 23, No. 10, p 1080-1088, June 1977. 2 tab, 27 ref.

Descriptors: *Water resources, *Planning, *Investment, *Economic efficiency, *Water allocation(Policy), Decision making, Regions, California, Algorithms, Equations, Constraints, Optimization, Mathematical models, Systems analy-

Identifiers: *Benders' decomposition, Quadratic programming, Integer programming, Sequencing, Benefit maximization.

Developed are models for water planning that simultaneously consider investment and allocation decisions. The framework is demonstrated for a region which includes the counties of San Luis Obispo and Santa Barbara in California. The quadratic discontinuous mathematical programming problems resulting from such models are solved optimally by using generalized Benders decomposition, a method for breaking a larger problem into a series of manageable subproblems which yield frasible solutions to the overall system. In this case, the decomposition is used to incorporate a quadratic programming allocation subproblem with an integer programming invest-ment sequencing problem. The objective function is the maximization of benefits; considered are the present value of a stream of expected net returns over time. Denoted is the vector of investment options, each element of which is location, scale, and time specific, giving the row vector of present values of expected investment costs for these op-tions. Details of the results of the regional applica-tion are discussed. (Bell-Cornell) AN ILLUSTRATIVE EXAMPLE OF THE USE OF MULTIATTRIBUTE UTILITY THEORY FOR WATER RESOURCE PLANNING, Woodward-Clyde Consultants, San Francisco,

Calif R. L. Keeney, and E. F. Wood.

Water Resources Research, Vol. 13, No. 4, p 705-712, August 1977. 5 fig, 2 tab, 8 equ, 34 ref.

Descriptors: *Water resources, planning, Regional development, Decision making, Assessment, Equations, Systems analysis. Identifiers: *Multiattribute utility theory, *Multi-objectives, Tisza River basin(Hungary), Rating, Trade-offs, Scaling factors.

Selecting a plan to devlop the water resources of a region involves the consideration of economic, environmental, social, and technical objectives. Twelve attributes are defined to indicate the degree to which such objectives are achieved in the Tisza River basin of Hungary. A preliminary multiattribute utility function is assessed over these attributes. This is combined with existing in-formation describing the possible consequences of five alternative development plans to yield an overall rating of their desirability. The utility function explicitly indicates the preference trade-offs among attributes. Discussion indicates further uses of the utility function in the planning and evaluation processes. Preliminary case study results indicate that building interbasin water transfers from the Danube River or small reservoirs in the northeast is to be preferred to developing three other planning alternatives. (Bell-Cor-W77-12169

6B. Evaluation Process

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.

Arizona Univ., Tucson. Office of Arid Lands Stu-

Papers presented during an Interdisciplinary Programs Seminar Series, August-December, 1976, The University of Arizona, Tucson, Office of Interdisciplinary Programs, Office of Arid Lands Studies, 1977. 176 p. Edited by R. L. Bulfin, Jr. and J. Richard Greenwall.

Descriptors: *Technology, *Foreign countries, *Adoption of practices, *Foreign projects, Projects, Arid lands, Resources development, Resources, Water storage, Industries, Nuclear energy, Greenhouses, Farm equipment, Remote sensing, Social aspects, Economics, Political

Identifiers: *Developing countries, Appropriate technology, US Foreign Assistance Programs, Technology transfer.

The successful transfer of Western technology to developing countries requires the technologist to realize that most Western technology is designed to be operated by well-trained and experienced people; requires special maintenance tools and test equipment; and is geared to the philosophy of inexpensive and unlimited energy, water, and other resources. For Western technology to assist developing countries effectively it must be ap-propriately adapted to local conditions in which specialized expertise, equipment, and resources are often lacking. The papers of this publication are grouped into an overview, low-level technolohigh-level technology, and a discussion of the gy, high-level technology, and a discussion of the U.S. Foreign Assistance Program. Applications of technology transfer in agriculture, water and grain storage, industry, nuclear technology, and remote sensing are addressed. In addition, one paper discusses the criteria for technology selection. (See W77-11638 thru W77-11640) (Ullery-Arizona) W77-11637

Group 6B—Evaluation Process

TECHNOLOGICAL SYSTEMS IN WATER AND GRAIN STORAGE Wunderman Foundation, New York.

H. Guggenheim.

In: The Application of Technology in Developing Countries, Papers Presented During an Inter-disciplinary Programs Seminar Series, August-December, 1976, The University of Arizona, Office of Interdisciplinary Programs, Office of Arid Lands Studies, 1977. p 21-35, 1 tab.

Descriptors: *Dependable supply, *Arid lands, *Foreign countries, *Water storage, *Storage requirements, *Cisterns, *Water tanks, *Construction, *Construction materials, Water Shortage, Technology, Projects, Structures, Architecture, Structural design, Cements, Waterproofing, Coatings, Droughts, Grains(Crops), Political aspects, Social aspects, Tangible benefits, Economics.
Identifiers: *Mali, Sahel, Operation mil, Ap-

propriate technology, Technology transfer.

The problems of introducing modern technologies which both benefit local populations and allow for the survival of traditional society is illustrated by assistance given to three villages in constructing water and grain storage systems in response to Mali's Sahelian drought. The uncertainty of rain on Mali's Dogon plateau makes storage an important means of reducing risk. Features of modern technology were introduced which blended tradi-tional building methods and village ssociety without harming the environment. A household cistern was constructed of local clay but was waterproofed and reinforced with a lining of chicken wire and ferro-cement. Basic characteristics of Dogon architecture were employed to channel water into the granery. In a second village all wells were dry and villagers searched three hours per day for water. Consultation with the village chief and elders made clear that for architectural, technical, and cultural reasons water graneries would be inefficient. Instead, with the assistance of villagers, a natural rock shelter that received run-off was converted into a cistern using traditional construction techniques in combination with chicken-wire, cement, and metal forming ferro-cement. in a third effort, an AID-financed Operation Mil granuary to ensure grain availability was constructed incorporating modern technical features and blending with other local structures. However, construction of large government storage facilities may not benefit the population due to the effects of government grain quotas and taxation systems. (See also W77-11637) (Ullery-Arizona) W77-11638

REMOTE SENSING AND DEVELOPING COUN-TRIES: POTENTIAL AND PROBLEMS IN THE TRANSFER OF TECHNOLOGY, Clark Univ., Worcester, Mass. Graduate School of

Geography.

L. Berry.
In: The Application of Technology in Developing Countries, Papers Presented During an Intern tional Programs Seminar Series August-December, 1976, The University of Arizona, son, Office of Interdisciplinary Programs, Office of Arid Lands Studies, p 73-83, 2 ref.

*Remote *Data sensing, *Satellites(Artificial), *Data collections, *Mapping, *Terrain analysis, *Monitoring, Regional development, Natural resources, Information exchange, Land use, Institutions, Institutional Planning, Population, Distribution constraints, patterns, Water resources, Surface water availability, Human resources.

Identifiers: *Developing countries, Egypt, *Developing countries, Egypt, Technology transfer.

Remote sensing data gathered by ERTS/LANDSAT satellites and now being provided to developing countries includes mapping of large scale features and remote areas; land use analysis; mineral deposits and geological mapping, structural analysis for locating mineral and water resources; monitoring population changes; agricultural inventories; locating surface water resources; and regional planning. Greatest emphasis in developing countries has been on the collection and analysis of data on natural resources needed to promote national development. Factors which may determine the nature, volume, and particular mix of information needed include the size of the country, resource endowment, available information, development goals, capacity to absorb information, and cost. Some problems include ineffective gathering of human resources informa-tion, the tendency to proceed too rapidly from relatively straightforward to sophisticated analysis, and a lack of institutional coordination for gathering and using information. Several developng nations have created institutional capabilities for using remote sensing technologies, and the way in which these institutions develop may be an important factor in delimiting the character and extent of remote sensing use in coming years. (See also W77-11637) (Ullery-Arizona) W77-11639

CONTROLLED-ENVIRONMENT AGRICUL-TURE AND THE DEVELOPING COUNTRIES, Arizona Univ., Tucson. Environmental Research

W. L. Collins, and C. N. Hodges

In: The Application of Technology in Developing Countries, Papers Presented During an Interna-tional Programs Seminar Series, August-December, 1976, Tucson, Arizona, The University of Arizona, Office of Interdisciplinary Programs, Office of Arid Lands Studies, p. 85-93, 1977.

Descriptors: *Greenhouses, *Experimental farms, *Environmental control, *Agriculture, *Crop production, Drought resistance, Soil conservation, Water conservation, Irrigation efficiency, Irrigation systems, Cultivation, Nutrient requirements, Environmental effects, Insect resistance, Deserts, Arid climates, Arid lands, Food abundance. Identifiers: *Developing countries.

The intensified production and locale flexibility of controlled-environment agriculture (EDA), i.e. greenhouses, may help solve basic problems of world agriculture, especially for developing countries. CEA can increase crop yields, reduce losses due to pests and weather, and uses less water, fertilizer, and land than conventional open-field agriculture thereby helping increase production while conserving resources. Selective use of CEA components in conventional agriculture such as seedhouses during drought or insect plague, and drip irrigation and fertilizer injection systems developed for CEA may be one of CEA's greatest contributions. CEA also frees growers from the uncertainties of weather, insects, and disease, uncertainties of weather, insects, and disease, thereby stabilizing the pattern of supply and de-mand. It may be the only answer to the problem of environmental damage from agriculture because it uses little land and does not deplete soil nutrients. Environmental damage of agriculture caused by man and global climate changes may be lessened by CEA because it permits crop production near urban and industrial areas and makes possible the retention of local food production in areas which retention of local food production in areas which no longer have good growing climates. (See also W77-11637) (Ullery-Arizona) W77-11640

DISASTERS AS A NECESSARY PART OF BENEFIT-COST ANALYSES, Geological Survey, Menlo Park, Calif. Branch of Western Environmental Geology. R. K. Mark, and D. E. Stuart-Alexander.

Science, Vol. 197, No. 4309, p 1160-1162, 16 September 1977. 29 ref.

Descriptors: *Cost-benefit analysis, *Diasters, Water resources, *Projects, *Costs, Dam failure, Earthquakes, Reservoirs, Landslides, Probability,

Identifiers: Urban areas.

Cost-benefit analyses for water resources projects generally do not include the expected costs (residual risk) of low-probability disasters, such as am failures, impoundment-induced earthquakes, and landslides. Analysis of the history of these types of events demonstrates that dam failures are not uncommon and that the probability of a reservoir-triggered earthquake increases with increas-ing reservoir depth. Because the expected costs from such events can be significant and risk is project-specific, estimates should be made for each project. The cost of expected damage from a 'high-risk' project in an urban area could be comparable to project benefits. (Bell-Cornell) W77-11765

A FACTOR ANALYSIS OF SOCIOECONOMIC CHANGE IN THE TENNESSEE RIVER CHANGE IN WATERSHED, Tobacco Tax Council, Richmond, Va.

V. G. Chappell, Jr.

Vater Resources Bulletin, Vol 13, No. 3, p 543-550. June 1977. 1 tab. 8 ref.

Descriptors: *Tennessee River, *Watersheds(Basins), Regional analysis, Data collections, Equations, Economics, Social aspects, Watershed management. Identifiers: *Factor analysis, *Socioeconomic

Factor analysis is utilized to identify and summarize the socioeconomic changes occurring in the Tennessee River Watershed. A general fa analysis program is applied to a set of 25 socioeconomic variables hypothesized to represent many of the dimensions of regional socioeconomic change. The analysis identifies seven factors that underlie and explain socioeconomic change in the Tennessee River Watershed. The factors may be used to describe satisfactorily the major portion of the variation in the 25 socioeconomic variables without increasing the problem of multicollinearity in further es. As an aid in watershed research, factor analysis permits inferences about the structure of economic and social development. Dependency among the various socioeconomic changes can more easily be determined. (Bell-Cornell)

INSTITUTIONALIZED INEFFICIENCY: THE UNFORTUNATE STRUCTURE OF COLORADO'S WATER RESOURCE MANAGE-

Colorado State Univ., Fort Collins. Dept. of Political Science. For primary bibliographic entry see Field 6E. W77-11768

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES,

Engineering-Science, Inc., Arcadia, Calif. D. V. MacDonald, K. P. Barney, Jr., and S. F.

Water Resources Bulletin, Vol. 13, No. 3, p 583-598, June 1977. 5 fig, 2 tab.

Descriptors: *Engineering, *Evaluation Economics, Water resources, Environmen Feasibility, Performance, Projects, Political aspects, Social aspects.

Identifiers: Public participation, Nonquantifiable aspectures.

parameters. Alternative evaluation procedures, Evaluation criteria, Rating scale, Evaluation system, Alternative selection, Local evaluation participation.

Described is a method of analyzing the nonquantifiable parameters which should be considered in the evaluation of engineering alternatives. The nonquantifiable parameters can include environmental impact, feasibility of implementation, and

performance. The method considers rating all the performance. The method considers rating all the alternatives on the basis of a set of criteria which reflect these parameters. A procedure is discussed for obtaining review and guidance in the evaluation of engineering alternatives from the local elected officials or governing bodies and for obtaining the views and desires of the local commutation. nities. This is achieved through the formation of project review committees and an evaluation procedure which allows for the technical rating of alternatives by the engineer and the weighing of the evaluation criteria by the political and social groups. With the growing environmental concern and the high cost of engineering projects, the in-volvement of the public during the evaluation of volvement of the public during the evaluation of the engineering projects is becoming increasingly important to the final success of the project. The evaluation factors considered are general, economic, energy, environmental (including the quality of ground, surface, and supply water), feacibility and performance (Pall Core-El). feasibility, and performance. (Bell-Cornell) W77-11771

A NONLINEAR MULTILEVEL MODEL FOR REGIONAL WATER RESOURCES PLANNING, Khonkaen Univ. (Thailand). Faculty of Engineer-

For primary bibliographic entry see Field 6A. W77-11772

A MULTICRITERIA ANALYSIS FOR WATER RESOURCE AND LAND USE DEVELOPMENT, Vrije Universiteit, Amsterdam (Netherlands). Dept. of Economics.

For primary bibliographic entry see Field 6A.

NEW GROWTH CENTERS-A ROLE FOR THE

BUREAU OF RECLAMATION, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

V. A. Koelzer. Journal of the Water Resources Planning and Management Division, Proceedings of the Amer-ican Society of Civil Engineers, Vol. 102, No. WR2, p 311-326, November 1976. 22 ref.

Descriptors: Water resources, *Growth rates, Population, Irrigation, Planning, Urbanization.
Identifiers: *Bureau of Reclamation,
*Population(Statistics), Population growth, Food Identifiers: supply, Urban planning.

Faced with a probable decline in its historic role of developing irrigation in the West, a new role is hypothesized for the U.S. Bureau of Reclamation. This role is in planning for other types of economic growth that will draw additional population to the West and cause the growth there of new population centers. The causes of a probable decline in subsidized irrigation, the rationale for encouraging future population growth to occur in the West rather than in the East, the means of such growth, and the types of impacts that would have to be analyzed are considered. This new planning role for the Bureau is seen as one way of utilizing the Bureau's capability. (Bell-Cornell) W77-11775

PLANNING FOR IMPLEMENTATION UNDER

SECTION 208, Environmental Protection Agency, Washington, D.C. For primary bibliographic entry see Field 5G. W77-11776

CARRYING CAPACITY: A BASIS FOR COASTAL PLANNING. North Carolina Univ. at Chapel Hill. Dept. of City

and Regional Planning.

D. R. Godschalk, F. H. Parker, and T. R. Knoche.

June 1974, 183 p, 4 tab, 2 fig.

Descriptors: *Carrying capacity, *Coastal areas, *Balance of nature, *Institutional constraints, *Limiting factors, Environmental effects, Social aspects, Psychological aspects, Political aspects, Ecology, Environmental control, Planning, Management, Social values, *Planning, North Carolina.

Identifiers: Carteret County(NC), *Coastal

Carrying capacity results from the interaction of environmental, socio-psychological, and institu-tional factors. In an area experiencing development pressure, carrying capacity, or the amount of development that is allowed to take place, depends on: the area's natural characteristics that limit development; the perceptions and values of area residents as expressed in their preferences for life-styles and environment; and the ability of the area's governing body and management agencies to provide the services and impose the controls necessary to insure that the desired quality of life ntained. is maintained. The environmental, socio-psychological, and institutional aspects of the carrying capacity concept are applied to the Carteret County case in North Carolina as they might be used to justify limiting the ultimate growth level or the rate of growth. The usefulness of the carrying capacity idea as a growth planning and policy tool is examined. The study includes an annotated bibliography of carrying capacity literature. This literature is summarized and integrated. Carrying capacity, as a planning tool, has primarily been ap-plied in two ways: in planning the intensity of ac-tivity for park and recreation areas; and in determining growth limits for areas experiencing development pressure. (Nessa-NC) W77-11853

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES, Southern Methodist Univ., Dallas, Tex. Inst. of

Tech.

For primary bibliographic entry see Field 3E. W77-11854

THE CALIFORNIA COASTAL PLAN: A CRITIQUE,

Institute for Contemporary Studies, San Francisco, Calif. E. Bardach, D. K. Benjamin, T. E. Borcherding, R. D. Eckert, and H. E. Frech, III. 1976. 199 p. 7 fig. 2 tab, 114 ref. \$3.95.

Descriptors: *Coasts, *Land use, *Planning, Pricing, Cost-benefit analysis, *Resource allocation, *Resource development, taxes(Charges), *California, Taxes, Costs, *Resource development, *Pollution taxes(Charges), *California, Taxes, Costs, Economics, Administration, Administrative costs, Economics, Administration, Administrative costs. Cost allocation, Cost comparisons, Alternative costs, Associated costs, Indirect costs, Intangible costs. Marginal costs, Real costs, Variable costs. Identifiers: "Coastal planning, Externalities.

A series of essays have been assembled that revolve around the idea that private activity is the most efficient and productive way to allocate resources when market prices correctly reflect the social costs and benefits. The externalities that regulations impose are compared to the externali-ties that regulations eliminate. The ability of cen-tralized planning to collect the accurate and timely tralized planning to collect the accurate a tralized planning to collect the accurate and timely information needed to price environmental goods is compared with the market system's ability to perform the same task. The costs of implementing the plan are assessed. A system of environmental usage fees is proposed. The impact of the proposed plan on the poorest segments of society is explored. A model is developed to analyze whether or not the Coastal Commission has actually changed lead were auture in the coastal tually changed land use patterns in the coastal zone. The plan is viewed from the private property owner's perspective. The institutional manifestations of property rights and their ability to resolve several specific economic problems are analyzed. Fundamental considerations of fairness and equity

in dealing with cost allocations are addressed. The adequacy of the energy and transportation elements of the plan are analyzed. The study concludes that a more efficient supply mechanism is needed to satisfy demands for environmental improvement. (Nessa-NC). W77-11855

SOCIO-ECONOMIC STUDIES OF THE UPPER ST. JOHNS RIVER BASIN, CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DIS-

Florida Univ., Gainesville. Dept. of Environmen-

tal Engineering Sciences.
J. P. Heaney, and W. C. Huber.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A021 680, Price codes: A19 in paper copy, A01 in microfiche. Prepared for Army Copps of Engineers, Engineer District, Jacksonville, FL, Report ENE 74071, July 1974. 433 p, 58 fig, 51 tab, 136 ref.

*River basin development, Descriptors: *Comprehensive planning, *Projections, *Environmental effects, *Social aspects, *Economic impact, Political aspects, Cost-benefit analysis, Hydrologic models, Linear pro-gramming, Computer simulation, Alternative gramming, Computer simulation, Alternative planning, Water resources, *Florida. Identifiers: *St. Johns River Basin(FL) *Environmental Impact Statements, Digital simu Basin(FL), lation models.

This study is divided into two parts, the first of which deals with the creation of a technique and procedure for use in the assessment of alternative ater resources development plans with due consideration of economic, social, and environmental effects relating to development and construction in the study area is described, an historical perspective is offered, the management alternatives are explained and the analytical framework is presented. The state of the art in environmental impact statment preparation is presented. The magnitude and significance of economic, social, and environmental effects are described, wherever possible, in terms of either monetary or energy units, and their interactions are explored. The social aspects are reviewed with respect to availa-ble merthodologies, and the results of field survey work in the context of a hypothetical regional board. A multi-objective linear programming model was developed for the economic analysis, which explores questions of national economic effciency and regional costs and benefits. The environmental analysis is based on a digital simula tion model that traces the flow of water and associated environmental impacts. The spatial and temporal distribution of the environmental im-pacts are evaluated. (Nessa-NC) W77-11859

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINAN-CIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LLF REPORT, PHASE II, Institute for Public Administration, New York. For primary bibliographic entry see Field 6F. W77-11860

CROWDING AND VISITOR CONFLICT ON THE BOIS BRULE RIVER, Wisconsin Univ., Madison. Dept. of Rural

Sociology.
T. A. Heberlein, and J. Vaske.
Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-272 314, tion service, springited, VA 22161 as PB-272314, Price code: A06 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-04, 1977. 109 p, 6 fig, 25 tab, 6 ref, 2 append. OWRT A-066-WIS(1), 14-31-0001-5050, 14-34-0001-6052.

Field 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Descriptors: *Recreation, Water sports, *Attitudes, *Behavior, *Recreation demand, *Social participation, *Tourism, *Parks, Camping, *Psychological aspects, *Carryi Wisconsin, Recreation facilities. Identifiers: *Bois Brule River(Wisc). *Carrying capacity,

Nearly three thousand canoers, tubers, and fishermen were interviewed as they left the upper Bois Brule river on 24 days in the late summer of 1975. Their perceptions of crowding, satisfaction, and reported contacts with other visitors were measured. In spite of daily use levels which ranged as high as 308 visitors on a ten mile stretch there was no relation between use level satisfaction (r = .01). Use level is related to perceived crowding (r = .32, p < .001), and feeling crowded is one aspect of overall satisfaction, (r = .14, p < .001). This study replicates prior research by Shelby on Colorado River visitors, and casts further doubt on an econometric model of carrying capacity which is based on an assumed relationship between use level and satisfaction of river visitors. Canoers and fishermen were the most visible recreationists in terms of contacts, and tubers were the least encountered, largely due to a natural zoning which takes place on the river. All visi-tor groups expressed similar motivations for their visit, such as being close to nature, while differing in level of commitment, and background variables. Tubers were more recent initiates to their sport and had less experience on other rivers than canoers and fishermen. W77-11865

REGIONAL WATER MANAGEMENT WITH

FULL CONSUMPTIVE USE,
New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Busi-

R. R. Lansford, S. Ben David, and B. R. Beattie. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 313, Price codes: A06 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 088, June, 1977, 112 p, 3 fig, 50 tab, 3 append. OWRT B-046-NMEX(1).

Descriptors: *Water utilization, *Optimization, Water supply, Water demand, Water resources development, "Regional development, Economics, Model studies, "Consumptive use, "Regional analysis, "Economic impact, "Social impact, "New Mexico, Evaluation, Texas.

Identifiers: Rio Grande Basin, "Elephant Butte Reservoir(N Mex), Fort Quitman(Tex), Input-Output model, Linear programming model.

The evaluation of social and economic impacts caused by alternate strategies dealing with water scarcity in the region of the Rio Grande Basin between Elephant Butte Reservoir, New Mexico and Fort Quitman, Texas was obtained through the development of a model which describes the water supply and demand characteristics of the region: describes the economic conditions of the region as related to water resources availability; identifies selected alternative futures with respect to water use, industrial development, and popula-tion growth and their impact upon the agricultural sector of the economy; evaluates the alternatives in terms of water use, employment, agricultural and industrial development, environmental impacts, and other related factors; and identifies institutional changes necessary for efficient manage-ment of the regional water resources. (Stockton -N Mex State) W77-11866

PROBLEMS AND WATER RESOURCES RESEARCH NEEDS OF THE IL-LINOIS RIVER SYSTEM.

Illinois Univ. at Urbana-Champaign. Water

Resources Center.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 405,

Price codes: A11 in paper copy, A01 in microfiche. Report UILU-WRC-77-0006, Special Report No. 6, June 1977. 212 p, 25 tab, 30 fig, 3 ref, Edited by P.C. Welch. OWRT A-999-ILL(5).

Descriptors: *Research priorities, Inland waterways, *Conferences, *River systems, *Illinois, Large watersheds, Water Resources Institute, *Water resources development. Identifiers: *Illinois River.

The Illinois River is a major pathway for the movement of freight between the Mississippi River at St. Louis and Chicago on the Great Lakes. Its basin includes large agricultural land areas in central and northern Illinois as well as a large in-dustrial area in northeastern Illinois and is heavily used by recreationists. Representatives of nu-merous disciplines and agencies were invited to review all aspects of potential problems and to define topics on which research is needed. One problem is the impact of barge traffic on the river, both in the erosion of banks and in the scouring og the river bottom, with sediment dept in suspen sion. Other sediment problems include agricultural runoff adn the die-off of bottom-dwelling organisms, with the subsequent loss of some wildlife. Energy production is another danger to small fish, which are sometines entrained in the cooling water flow. Important research areas also involve a study of the impact of increased withdrawals for supplementary irrigation of crops and the changes in water quality problems in the upper reaches of the Illinois River as the Metropolitan Sanitary Dis-trict of Greater Chicago upgrades its waste treatment facilities and retains storm water for treatment. Current plans by state agencies to develop a water permit system will also create many changes which need to be fully studied. (Stout-Illinois) W77-11937

SELECTING AND PLANNING HIGH COUNTRY RESERVOIRS FOR RECREATION WITHIN A MULTIPURPOSE MANAGEMENT FRAMEWORK.

Colorado State Univ. Fort Collins. Dept. of Recreation Resources.

R. Aukerman, C. A. Carlson, R. L. Hiller, and J.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 402, Price codes: A15 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No. 78, July 1977, 330 p, 8 fig, 11 tab, 63 ref, 3 append. OWRT B-132-COLO(3), 14-34-0001-6062.

Descriptors: *Recreation, *Reservoirs, *Planning, Water resources, *Management, *Decision-making, Fisheries, Fishing.

This report is presented to help decision makers, managers, planners and owners of water and its adjacent lands make more informed decisions on the selection and development of high country reservoirs for recreation. The following questions are answered in varying degrees by the scientific findings of the study: (1) How can we determine which reservoirs are best suited for various recreation user groups. (2) What important factors must be considered in selecting suitable reservoirs and developing these reservoirs. developing these reservoirs for recreation. (3) Why is it important to consider those factors. (4) What is the effect of drawdown on the reservoir fishery. (5) Is there enough available water in the river basin to meet recreation needs as, at the same time, meet the water rights of agricultural, municipal and domestic users. What trade-offs are required. (6) How can the practitioner determine water availability for recreation. (7) What managerial options are available for enhancing recreation use as much as possible without harming other water users. (8) What are the legal options, liabilities, and limitations on obtaining water and utilizing reservoirs for recreation. Findings which are incorporated into a practical decision process in the process orders data and provdes a framework for selecting, planning and managing reservours for recreation. recreation resources, fishery biology, water resources engineering and law combine in a truly interdisciplinary study finding which are incorporated into a practical decision process. The process orders data and provides a framework for selecting, planning and managing reservoirs for recreation. W77-11938

THE CENTRAL ARIZONA PROJECT: 1918-

Central Arizona Project Association, Phoenix.

The University of Arizona Press, Tucson. 1977, 242 p, 56 ref.

Descriptors: *Arizona, *Colorado River, *Water resources development, *Political aspects, *Water transfer, *Colorado River compact, *Mexican Water Treaty, California, Dams, Southwest US, Legal aspects, Legislation, Competing uses, Water rights, Water allocation(Policy), Water utilization, Projects.
Identifiers: *Central Arizona Project.

The plan to bring water from the Colorado River mainstream into central Arizona is discussed in detail. Controversial water problems and issues facing Arizona and other involved western states are examined, legal and political events from 1919 to 1968, are clarified, and the battle within Arizona are project described. Compromises made to satisfy conflicts among the seven concerned states are explained and the passage of the Central Arizona Project Act is described. Water issues and problems since 1968 are briefly examined. (Jewkes-Arizona) over the project described. Compromises made to W77-11999

SHORT COURSE PROCEEDINGS - APPLICA-TIONS OF STORMWATER MANAGEMENT MODELS, 1976, Massachusetts Univ. Amherst.

For primary bibliographic entry see Field 6A. W77-12074

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY

COST OF URBAN STORMWATER QUALITY MANAGEMENT, Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
J. P. Heaney, and S. H. Hasan.
In: Short Course Proceedings, Applications of Stormwater Management Models - 1976, 1977. p 15-33, 3 fig, 2 tab, 14 ref. Report EPA-600/2-77-065.

Descriptors: *Costs, *Forecasting, *Storm water, *Combined sewers, *Model studies, Urban runoff, Mathematical models, Mathematical studies, Cost comparisons, Storm runoff, Water quality, Waste water treatment.
Identifiers: Storage-treatment isoquants, STORM,

Procedures used during an EPA-sponsored study to estimate the nationwide cost of treating combined sewer overflows and storm water runoff are described. The EPA Storm Water Management Model (SWMM) was used to simulate a single storm event for a single catchment area for each of five cities in the U.S. The HEC STORM model was used to estimate hourly precipitation, runoff, and discharge rates for projections of the total volume of storm water treated for a specified size of storage unit and treatment rate. Results were used to derive storage-treatment isoquants. Mathematical derivations and procedures for adjustment according to treatment efficiency are given for the calculated isoquants. Formulas are given for the estimation of costs for storm water management based on quality control. Potential savings due to multipurose planning and the in-tegration of wet- and dry-weather treatment are considered. (See also W77-12074) W77-12075

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN, Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 4A. W77-12162

A NEW APPROACH FOR ESTIMATING IR. RIGATION CONVEYANCE LOSSES AND THEIR ECONOMIC EVALUATION,

Escuela Nacional de Agricultura, Chapingo (Mexico). Colegio de Postgraduados. For primary bibliographic entry see Field 3F. W77-12164

REGIONAL MANAGEMENT OF URBAN AND AGRICULTURAL POLLUTION, Windsor Univ. (Ontario).

For primary bibliographic entry see Field 5G.

SIMULTANEOUS INVESTMENT AND ALLO-CATION DECISIONS APPLIED TO WATER PLANNING.

Texas Univ. at Austin.

For primary bibliographic entry see Field 6A. W77-12168

AN ILLUSTRATIVE EXAMPLE OF THE USE OF MULTIATTRIBUTE UTILITY THEORY FOR WATER RESOURCE PLANNING, Woodward-Clyde Consultants, San Francisco,

For primary bibliographic entry see Field 6A. W77-12169

NEW YORK'S MARINE FISHERIES: CHANG-ING NEEDS IN A CHANGING ENVIRONMENT, New York State Dept. of Environmental Conser vation, Stony Brook. Div. of Marine and Coastal Resources.

New York Fish and Game Journal, Vol 24, No 2, p 99-127, 1977. 7 fig, 2 tab, 52 ref.

Descriptors: *Management, *Fish management, *Fisheries, *Commercial fishing, *Marine fisheries, Technology, New York, Fish, Environmental effects, Water pollution sources, Water quality, Water pollution effects, Mercury, Polychlorinated biphenyls, Commercial shellfish, Reviews.

New York marine fisheries has undergone tremendous changes over the past quarter-century. Increased pressure from foreign fishing fleets, changing domestic emphasis from commercial to recreational fishing and a changing marine environment (from natural as well as man-made causes) has produced changes in species composition in some ecosystems and in the availabiltiy and usability of a number of food species. Mercury, PCB's and other pollutants have threatened the usefulness of several species. Pollution from domestic wastes has forced the closure of productive shellfish grounds. The possibility of offshore drilling for oil and gas poses a serious dilemma for coastal zone managers and fisheries managers. The increase in the number of marine anglers has put heavy pressure on several fish stocks. New management programs were suggested to bring our present programs into line with technological, so-cial, and environmental changes. (Klein) W77-12247

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

DISASTER-CAUSED INCREASES IN UNIT

REPAIR COST, Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 6F. W77-11777

WATER AND SEWER RATES IN MINNESOTA, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.

ardner, and J. J. Waelti.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 307, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Center, Univ. of Minn., Bulletin 94, August 1977. 151 p, 2 fig, 16 tab, append. OWRT A-031-MINN(3), 14-34-0001-7050.

Descriptors: *Minnesota, *Water rates, *Use rates, Sewers, *Pricing, *Cities, *Rates, Water Utilization, Data collection. Identifiers: *Sewer rates.

Results are summarized of a survey of water and sewer rates in the State of Minnesota. Typical monthly water and sewer bills were computed for small, medium and large municipalities. Summaries were made of the frequency of various rate forms for various sizes of municipalities. Individual water and sewer rates are given for those municipalities responding to the survey. W77-11868

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

T. G. Carr.

Master of Science thesis (1977). 61 p, 9 fig, 4 tab, 37 ref, 2 append.

Descriptors: *Water policy, *Water rates, *Water costs, *Competing uses, *Water supply, *Arizona water users, Water demand, Water sources, Costs, Economics, Agriculture, Water conservation, Water management(Applied), Water con-sumption, Prices, Farms, Economic impact, Ir-rigation, Water allocation(Policy), Forecasting, Legal aspects.

Identifiers: Central Arizona Project, Maricopa County, Pima County, Pinal County.

Sixty percent of Arizona's water supply comes from groundwater aquifers. Agriculture accounts for 89 percent of all water use in Maricopa (Phoenix), Pima (Tucson), and Pinal Counties of Arizona, but irrigated agriculture returns the lowest amount of personal income per acre foot of water among the major Arizona economic sectors. Many wish to reallocate water from irrigated agriculture since it is the largest and most economically inefficient user. This study analyzes some of the current strategies proposed. Arizona's water resources, water conservation strategies, and economic projections concerning water costs are reviewed, policies and strategies to relieve water problems are evaluated. Conclusions presented suggest that the basic policy contemplated by the State is to reduce overdraft situations through comprehensive management of Arizona's water resources, entailing physical management such as the Central Arizona Project, to increase renewable supplies and demand agement, entailing economic or legal strategies. Most of Arizona's proposed demand strate-gies would reduce agricultural water use through higher pricing (Jamail-Arizona) W77-11997 SUBSURFACE DRAINAGE COST AND HYDROLOGIC MODEL,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering. For primary bibliographic entry see Field 4B. W77-12166

MODIFICATION OF RIVER BEDS AND OF THE COURSES OF RIVERS IN UPPER BELGI-UM, (IN FRENCH),

Nat Belg 57(6/7), p 150-162, 1976.

Descriptors: Rivers, *Flood control, Ecology, Environmental effects, River beds, Aquatic plants, Birds, Fish population. Identifiers: *Belgium, Ourthe River, Semoir River, Vierre River, Lomme River.

The destruction of aquatic plant, bird and fish populations resulting from flood control efforts along the Ourthe, Semois, Vierre and Lomme Rivers is discussed. Consideration of ecological implications is suggested before further planning.— Copyright 1977, Biological Abstracts, Inc. W77-12183

6D. Water Demand

REMOTE SENSING OF WATER DEMAND IN-FORMATION,

California Univ., Santa Barbara. Dept. of Geography.

J. R. Jensen, J. E. Estes, L. W. Bowden, and L. R. Tinney.

Geographical Review, Vol 67, No 3, July, 1977. p 322-334, 4 fig, 6 tab.

Descriptors: *Remote sensing, *Water demand, *Water supply, *Water management(Applied), *Water resources, *Projections, *Model studies, *Forecasting, *Data collections, Aerial photography, Mapping, Regions, Analytical techniques, Urban mapping, Land use, Land classification, Agriculture, Computer models, Data storage and retrieval. Terrain analysis. Identifiers: Landsat imagery

Existing water supply and demand prediction models are localized in areal extent and rely on historical data and therefore are inadequate for urban and agricultural use on regional, state, and international bases. Models capable of structuring, synthesizing, and producing viable user-oriented water demand data over large areas have not yet been fully developed. The results of research in California's Kern County and Upper Santa Ana River Basin indicate the existence of remote sensing capabilities necessary to improve the efficiency and utility of such models. To test the effectiveness of remote sensing to provide cropland information in Kern County as model input, data obtained from high-altitude photography and Landsat imagery were compared with data obtained from ground surveys. Analysis confirmed both remote sensing techniques to be almost as accurate as conventional surveys. In the Upper Santa Ana River Basin the applicability of remote sensing images for mapping land use categories re-lated to water demand was demonstrated by researchers. The demonstration indicated considerable benefits in terms of time, cost, and accuracy. (Ullery-Arizona) W77-11635

FUTURE NEEDS FOR DRY OR PEAK SHAVED DRY/WET COOLING AND SIGNIFICANCE TO NUCLEAR POWER PLANTS. General Electric Co., San Jose, Calif.

For primary bibliographic entry see Field 3E. W77-11848

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

POTENTIAL OF TIDAL AND GULF STREAM POWER SOURCES, Southern Methodist Univ., Dallas, Tex. Inst. of

Tech.

or primary bibliographic entry see Field 3E. W77-11854

CROWDING AND VISITOR CONFLICT ON THE BOIS BRULE RIVER,

Wisconsin Univ., Madison. Dept. of Rural Sociology.

For primary bibliographic entry see Field 6B. W77-11865

REGIONAL WATER MANAGEMENT WITH

FULL CONSUMPTIVE USE, New Mexico State Univ., University Park. Dept. of Agricultural Economics and Agricultural Busi-

For primary bibliographic entry see Field 6B.

SUMMARY APPRAISALS OF THE NATION'S **GROUND-WATER** RESOURCES-GREAT BASIN REGION,

Geological Survey, Carson City, Nev. Water Resources Div.; and Salt Lake City, Utah. Water Resources Div.

For primary bibliographic entry see Field 4B. W77-11873

CONSERVATION IN KANO,

For primary bibliographic entry see Field 4B. W77-11993

AGRICULTURAL RESPONSE TO CHANGING WATER PRICES IN ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 6C. W77-11997

A TEST OF ALTERNATIVES FOR MEETING PUBLIC POTABLE WATER REQUIREMENTS. Rutgers - The State Univ., New Brunswick, N.J. Dept. of Urban Studies.
For primary bibliographic entry see Field 5G.
W77-12159

6E. Water Law and Institutions

THE APPLICATION OF TECHNOLOGY IN DEVELOPING COUNTRIES.

Arizona Univ., Tucson. Office of Arid Lands Stu-

For primary bibliographic entry see Field 6B. W77-11637

INSTITUTIONALIZED INEFFICIENCY: THE UNFORTUNATE STRUCTURE COLORADO'S WATER RESOURCE MANAGE-MENT SYSTEM,

Colorado State Univ., Fort Collins. Dept. of Political Science.

Water Resources Bulletin, Vol. 13, No. 3, p 551-562. June 1977, 3 ref.

Descriptors: Water resources, *Water management(Applied), *Colorado, Water rights, Control, Irrigation, Technology, Investment, Human population, Economics, Water distribution(Policy),

Imgaton, Technology, investical, Tallian population, Economics, Water distribution(Policy), *Institutions, *Institutional constraints. Identifiers: Technological innovation, Special interests, Water distribution patterns, Water use

Identified are two basic structural features of Colorado's water management system which inhibit constructive reform and perpetuate ineffi-ciencies in water utilization and distribution patterns. These features are: (1) the fragmentation of authority and influence over water, and (2) the estrangement of interest in reform from formal control over water policy. These interrelated features have continued to produce: sproadic, high conflict have continued to produce: sproame, night conflict battles over proposed changes in the status quo; decision making which tends to exaggerate the im-portance of narrow, special interests while vir-tually ignoring legitimate interests of major sectors of the public; an inertia which discourages innovation; and an agglomeration of rules and water rights that are predicted on obsolete social and economic needs. Two radical proposals for reforming the state's water resource management system in order to overcome these problems and to enhance the probability that wise water policy will result are offered. These proposals are: (1) the abolition of the present system of water rights founded on the doctrine of prior appropriation; and (2) the consolidation of authority over water allocation in a single board of governors. (Bell-Cornell) W77-11768

PLANNING FOR IMPLEMENTATION UNDER

Environmental Protection Agency, Washington, D.C.

For primary bibliographic entry see Field 5G. W77-11776

EFFICIENCY PROBLEMS FROM USER FEES IN MUNICIPAL WASTEWATER TREATMENT. National Bureau of Standards, Washington, D.C. **Building Economics Section.**

For primary bibliographic entry see Field 5D. W77-11783

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS.

Arizona Univ., Tucson. Office of Arid Lands Stu-

M. C. Nelson

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 299, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper No. 9, September 1977. 147 p, 3 fig., 3 tab, 87 ref. OWRT W231(No. 7303)(1).

Descriptors: *Water law, *Water rights, *Indian reservations, *Irrigable land, *Allotments, Legal aspects, Riparian rights, Treaties, Priorities, Beneficial use, Prior appropriation, Reservation doctrine, Federal-State water rights conflicts, Federal jurisdiction, River systems, *Reviews, Bibliographies.
Identifiers: *Winters doctrine, McCarran Amend-

An in-depth study is provided of the literature, both legal and general, relating to the Winters doctrine (Winters v. United States, 207 U.S.), commonly used to designate Indian implied by the courts from treaties and other government agreements involving Indian tribes. The topic is currently of considerable importance in water-short western states because of the effects of waters so 'reserved' being exempt from appropriation by non-Indians. The literature relating to the original Winters doctrine as enunciated first in 1908 is scattered throughout a wide spectrum of sources, and in bringing such together here it is expected that both the general public and the legal profession will benefit from this historical overview of subsequent claims over the past seventy years. Included are chapters on the nature of Indian reserved water rights; western water law and Indian reserved water rights; a case law development -- Winters through Arizona v. California (1963) which describes in detail twelve major cases that have determined the bounds of Indian reserved

water rights; and judicial protection of Indian water rights under the McCarran Amendment. A list of 64 additional related cases is given, with brief annotations, arranged chronologically first, then by court level; and finally those reserved water rights cases currently pending before the courts, 28 in number. An 87-item annotated bibliography of the general literature dealing with Winters is appended. (Paylore-Arizona) W77-11787

METHODOLOGY FOR DESIGNATION OF AD-JACENT COASTAL STATES, Little (Arthur D.), Cambridge, Mass

C. B. Cooper, M. C. Huston, and A. S. Kalelkar. Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A024 483, Price codes: A05 in paper copy, A01 in microfiche. Final report to U.S. Coast Guard, Revised, Report CG-WDWP-1-76, March 12, 1970 10 p. 6 ft a. 2 tel. 2 ref. 2 or append C 27274 20 70 p, 6 fig, 3 tab, 12 ref, 2 append. C-78784-20, DOT-CG-52269-A.

Descriptors: *Environmental effects, *Shore protection, *Coasts, *Harbors, Methodology, Decision making, Management, Planning, Risks. Forecasting.
Identifiers: *Deepwater Port Act, *Adjacent

coastal state.

Section 9 of the Deepwater Port Act of 1974 (P.L. 93-627) provides for the designation of 'adjacent coastal states.' The report discusses a designation methodology, involving: (1) receipt of a State's request for designation, which must include all available supporting documentation; (2) estimation, based upon interpretation of port applicants' data, of independent risks to the coastal environment of any state directly connected by pipeline to the deepwater port (especially oil spills), and portrelated secondary development; (3) evaluation of the validity of the State's estimates of potential port-related damage; (4) comparison of the damage estimates rom (2) and (3) without artificial aggregation to a single unit of measure (e.g. dollars); the risk of environmental damage would be compared to a resource-by-resource basis; (5) consideration of the recommendation submitted by the Administrator of NOAA; and (6) granting of adjacent coastal state status to any petitioning state that appears to risk equal or greater damage to its coastal environment than would the pipeline State from either facilities or activities directly associated with the port or port-related secondary development. Two appendices provide informa-tion regarding additional sources of data on cultural resources in Gulf Coast states, and detailed aspects of environmental risk methodology. (Nessa-NC) W77-11849

THE APPLICATION OF NONSTRUCTURAL MEASURES TO COASTAL FLOODING, Cheney, Miller, Ellis, and Associates, Inc., Putnam, Conn.

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For primary bibliographic entry see Field 2L. W77-11852

CARRYING CAPACITY: A BASIS FOR COASTAL PLANNING. North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning. For primary bibliographic entry see Field 6B. W77-11853

THE CALIFORNIA COASTAL PLAN: A CRITIQUE, Institute for Contemporary Studies, San Francisco, Calif.

For primary bibliographic entry see Field 6B. W77-11855

Nonstructural Alternatives—Group 6F

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINAN-CIAL METHODS FOR IMPLEMENTING PUR-POSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II, Institute for Public Administration, New York. For primary bibliographic entry see Field 6F.

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS, For primary bibliographic entry see Field 5G. W77-11863

ALABAMA PUBLIC MEETING SERIES ON COASTAL ZONE BOUNDARIES, NOVEMBER - DECEMBER, 1975. INTERPRETATIONS, Alabama Development Office, Montgomery. L. W. Hyde.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 021, Price codes: A07 in paper copy, A01 in microfiche. Mississippi-Alabama Sea Grant Consortium Publication No. MASGP-76-011, March 1976. 128 p.

Descriptors: *Coasts, *Water quality control, *Conferences, *Boundaries(Property), Alabama, Water law, Wetlands, Water manageent(Applied). Identifiers: Coastal zone management.

Five meetings were held in Mobile and Baldwin Counties in November and December, 1975, for the purpose of soliciting public input into the definition of the Alabama coastal zone boundary. In addition to serving as a forum for developing ideas on the boundary definition, the meetings served as an opportunity to create public awareness of the coastal zone program and as a medium of interchange of ideas on a wide range of coastal zone related topics. This report summarizes the meetings and attempts to draw general conclusions from the public's comments regarding the coastal zone boundary and related items. Transcripts of meetings are included with only a minor amount of editing. (Sinha-OEIS)

THE CENTRAL ARIZONA PROJECT: 1918-

Central Arizona Project Association, Phoenix. For primary bibliographic entry see Field 6B. W77-11999

6F. Nonstructural Alternatives

DISASTERS AS A NECESSARY PART OF BENEFIT-COST ANALYSES, Geological Survey, Menlo Park, Calif. Branch of Watter Engineers of Carlot Western Environmental Geology. For primary bibliographic entry see Field 6B. W77-11765

DISASTER-CAUSED INCREASES IN UNIT REPAIR COST.

Army Engineer District, Norfolk, Va. T. N. Yancy, Jr., L. D. James, D. E. Jones, Jr., and J. Goedert

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Journal of the Water Resources Planning and Management Division, Proceedings of the Amer-ican Society of Civil Engineers, Vol. 102, No. WR2, p 265-282, November 1976. 1 fig, 8 tab, 25

Descriptors: *Flood control, *Flood damage, *Repairing, *Costs, *Construction, *Disasters, Floods, Hurricanes, Tornadoes. Identifiers: Economic analysis.

Disaster damage estimates customarily assume that labor and materials will be readily available for repairs. When major disasters do more damage than the local building industry can repair, the resultant shortage of repair resources causes prices to escalate. Examination of the factors that effect the supply of and demand for repair services in the context of such recent disasters as Hurricane Camille and Tropical Storm Agnes suggests the amount of direct damage divided by the annual volume of contract constuction in the local BEA Economic Area as a reasonable index to the degree of escalation. Information on 15 disasters suggests that serious escalation begins at an index value of about 1.0. Information on damages caused by Agnes to Wilkes-Barre, Pa., indicates that an event of index value 9.1 increased repair costs by a factor of 2.7 and total damages (including relief programs) by a factor of 4.0, an effect that more than doubled average annual flood damages. (Bell-Cornell) W77-11777

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO.

Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 4A. W77-11834

FLOOD PLAIN INFORMATION: FRANK-STOWN BRANCH JUNIATA RIVER, Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 4A. W77-11835

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA.

Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 4A. W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA Army Engineer District, Buffalo, N.Y.

For primary bibliographic entry see Field 4A.

PLAIN INFORMATION: FLOOD ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.

Army Engineer District, Detroit, Mich. For primary bibliographic entry see Field 4A. W77-11838

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN. Army Engineer District, Detroit, Mich. For primary bibliographic entry see Field 4A. W77-11839

FLOOD PLAIN INFORMATION: ATLANTA. TEXAS: BLACK BAYOU AND TRIBUTARIES. Army Engineer District, New Orleans, LA. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: CHADAKOIN JAMESTOWN-FALCONER. NEW

Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 4A. W77-11841

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTA-RIES, ROCKLIN, CALIFORNIA. Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 4A.

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE,

Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 4A. W77-11843

FLOOD PLAIN INFORMATION: ANDROSCOG-GIN AND DEAD RIVERS, LEEDS, MAINE. Army Engineer District, Waltham, Mass. New England Div. For primary bibliographic entry see Field 4A. W77-11844

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA. Army Engineer District, Waltham, Mass. New En-

gland Div. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE. Army Engineer District, Waltham, Mass. New En-

gland Div. For primary bibliographic entry see Field 4A. W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.

Army Engineer District, Waltham, Mass. New En-For primary bibliographic entry see Field 4A. W77-11847

A PERSPECTIVE ON FLOOD PROTECTION OF AGRICULTURAL LANDS.

Development and Resources Corp., Sacramento, Calif.

Submitted to U.S. Army Engineer Institute for Water Resources, Fort Belvoir, VA, December 1976. 76 p, 23 tab, 2 fig. IWR: 76-3, DACW31-76-

Descriptors: *Flood control, *Crop production, *Agriculture, Flood data, Soils, Land reclamation, Wetlands, Drainage systems.

Identifiers: *National Water Assessment, Interregional model, Food production, Agricultural land

use, Crop damage.

U.S. agricultural policy has shifted from controlling overproduction to encouraging more production. The impact of this shift on agricultural flood control is analyzed. Five major studies projecting world food demand and production are summarized. The interregional model being developed at Iowa State University for the National Water Assessment (NWA) is availabled. The tional Water Assessment (NWA) is evaluated. The evaluation includes the NWA's potential applica-tion in indicating the use of rural lands protected by Army Corps of Engineers (ACE) projects. Pro-grum data from ACE on the status of rural lands affected by flood control and drainage projects are surveyed. A cross section of flood plain data now available is surveyed, including the content and format of the data. The present ACE methodology for flood control and drainage impacts on agricul-tural productivity is examined as it relates to floo soils. The methodology used to evalua-

Field 6-WATER RESOURCES PLANNING

Group 6F-Nonstructural Alternatives

soils are highly competitive producers. The total area of irrigated and reclaimed agricultural wellands will increase. Program priority for agricultural flood control needs examination. If balance of payments and foreign policy factors are significant, a higher priority for agricultural flood control might be in order. (Nessa-NC) W77-11850

EVALUATION OF AND RECOMMENDATIONS FOR LEGAL, INSTITUTIONAL AND FINAN-CIAL METHODS FOR IMPLEMENTING PURPOSES AND PLANS FOR FLOOD PLAIN MANAGEMENT IN CONNECTICUT RIVER BASIN: LIF REPORT, PHASE II, Institute for Public Administration, New York.

R. P. Mack, H. C. Miller, J. R. Flood, and A. H. Walsh.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 122, Price codes: A17 in paper copy, A01 in microfiche. Prepared for New England River Basins Commission, Boston, Mass., March 1976. 365 p, 25 ref, append.

Descriptors: *Connecticut River, *Non-structual alternatives, *Land use, *Cost comparisons, *Planning, Warning systems, Flood plain insurance, Mapping, Floodproofing, Relocation, Cost-benefit analysis, Building codes, Governments, Institutional constraints.

Identifiers: *Flood plain management, Open space preservation, Citizen participation, Flood episode management.

The objective is to determine how the flood plain of the Connecticut River Basin can be used most wisely. Major impoundments were not found to be a cost-effective solution. Consequently, emphasis is placed on nonstructural methods such as river forecast services and community flood episode management, the Federal Flood Insurance Program, mapping, preserving land for open space, temporary or permanent relocation or floodproofing under a cost-effective constraint, land use and building regulations, and encouraging and facilitating desirable shifts in locational patterns. Nonstructural methods that attempt to resettle all flood plain occupants at public expense were not found to be cost-effective. Instead, partial and piecemeal resettlement is advocated. There appears to be adequate room in most towns or urban areas to accommodate future growth, as well as the accom-modate relocation. The net result in most places should be neutral or beneficial for the community snould be neutral or beneficial for the community as a whole. State governments must take primary responsibility in devising and effectuating these procedures. They must do so as part of an overlap of local, state, regional and federal governments, each using the instrumentalities available to them. Citizen involvement and participation at many levels is essential. (Nessa-NC) (See also W77-03774 and W76-05653) W77-11860

GUIDELINES FOR FLOOD DAMAGE REDUCTION.

Army Engineer District, Sacramento, Calif. 1976, 21 p, 7 fig.

Descriptors: *Flood protection, *Control structures, *Non-structural alternatives, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, Levee, Embankments, Floodwalls, Dams, Reservoirs, Diversion structures, Erosion control, Channel improvement, Dredging. Identifiers: *Encroachment lines, *Flood plain management, *Structural alternatives.

Flood plain management involves local government control over the use of flood plain lands, separately or in combination with control of floodwaters. Conventional management techniques utilize physical alteration of the landscape in order to control floodwaters. Dams and reservoirs store water when streamflow is excessive. Levees and

floodwalls act as barriers between a stream and the area to be protected. Channel improvements reduce flooding by improving flow conditions. Flood-way bypasses and diversions decrease the flow in the main channel, improve flow characteristics, and decrease flood stage. Watershed treatment measures render soils more capable of absorbing and retaining excessive rainfall. Nonconventional management techniques, known as flood plain regulations, mold flood plain use and development to reduce flood hazards and minimize damage. Zoning is used to control and direct the use and development of land. Building codes specify construction standards that protect tealth, safety, and the general welfare. Subdivi-sion regulations specify the manner in which land may be divided and developed for sale. Develop-ment policies that limit extension of streets and utilities into flood prone areas will funnel growth into appropriate areas. Other techniques, such as flood proofing, evacuation, tax adjustments, open space acquisition and flood plain insurance are discussed. (Nessa-NC) W77-11862

FLOOD-PRONE AREAS AND LAND-USE PLANNING-SELECTED EXAMPLES FROM THE SAN FRANCISCO BAY REGION, CALIFORNIA,

Geological Survey, Menlo Park, Calif. Water Resources Div.; Geological Survey, Menlo Park, Calif. Conservation Div.; and William Spangle and Associates, Portola Valley, Calif. For primary bibliographic entry see Field 4A.

CHICAGO METROPOLITAN FLOODWATER MANAGEMENT PLAN, Metropolitan Sanitary District of Greater Chicago,

Metropolitan Sanitary District of Greater Chicago III.
For primary bibliographic entry see Field 4A.

6G. Ecologic Impact Of Water Development

GUIDEBOOK TO GEOLOGIC AND BEACH FEATURES OF THE RACHEL CARSON SALT POND AREA, NEW HARBOR, MAINE, Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 2L. W77-11656

NEW ENGLAND OFFSHORE MINING EN-VIRONMENTAL STUDY (PROJECT NOMES), National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs. For primary bibliographic entry see Field 2L. W77-11660

NEW YORK BIGHT PROJECT. PROJECT DEVELOPMENT PLAN AND TECHNICAL DEVELOPMENT PLAN.

National Oceanic and Atmospheric Administration, Boulder, Colo. Marine Ecosystems Analysis Program Office. For primary bibliographic entry see Field 5B. W77-11661

PROCEDURES FOR THE EVALUATION OF ENGINEERING ALTERNATIVES, Engineering-Science, Inc., Arcadia, Calif. For primary bibliographic entry see Field 6B. W77-1171

AN INVESTIGATION INTO ENVIRONMENTAL EFFECTS OF SEWAGE EFFLUENT REUSE AT

THE KANE'OHE MARINE CORPS AIR STA-TION KLIPPER GOLF COURSE, Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 5D. W77-11792

SOCIAL, ECONOMIC, AND ENVIRONMEN-TAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS, AME Technology, Inc., Lexington, Ky.

R. G. Edwards, A. B. Broderson, and W. P. Hauser.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 747, Price codes: A12 in paper copy, A01 in microfiche. Prepared for University of Kentucky Institute for Mining and Minerals Research, Lexington, Report IMMR14-GR2-76, April 1976, 269 p, 5 tab, 14 fig, 438 ref.

Descriptors: *Environmental effects, *Social aspects, *Economic impact, *Planning, Land use, Solid wastes, Sedimentation, Acid mine water, Water use, Land reclamation, Social change, Bibliographies.

Identifiers: *Coal gasification, *Coal liquefaction.

The water related impacts of a typical coal gasification and liquefaction plant include the use of 10-25,000 acre feet of water annually, with additional water required for the mine, land reclamation, and municipal growth. Adequate water supplies are essential. Water pollution concerns include acid mine drainage, leaching from buried wastes, leakage from the plant, and sedimentation from the large amounts of land disturbed. Disposal of up to 20,000 tons of ash, sulfur, sulfate sludges, mine tailings, and other solid wastes is a major concern. Socioeconomic balances will incur perhaps the greatest impacts. There will typically be 3,700 new jobs and 15,000 new people. Schools, roads, mu-nicipal facilities, and others may become overcrowded. Major planning will be required to convert the economy of affected areas from an energy to a nonenergy base to avoid a local depression in 20-30 years after the coal has been depleted. The land development which will occur for town areas, new services, and mine reclamation will create a need for area-wide land use planning. 25-60 megawatts of electricity will be required for the plant, and many more utilities will be required for new growth. These factors will create a complex siting problem. (Nessa-NC) W77-11851

FINAL ENVIRONMENTAL IMPACT STATE-MENT: AUBURN INTERCEPTOR (GREEN RIVER SEWERAGE AREA), KING COUNTY, WASHINGTON.

Environmental Protection Agency, Seattle, Wash. Region X. For primary bibliographic entry see Field 5D. W77-11861

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES, American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div. For primary bibliographic entry see Field 7B. W77-11874

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NUTRIENTS IN THE NEUSE RIVER ESTUARY. North Carolina State Univ. at Raleigh. Dept. of Zoology. For primary bibliographic entry see Field 5C.

Data Acquisition—Group 7B

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. NORTHEAST GULF OF ALASKA. National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.

Annual Reports Summary-1975. Report to the Bu-reau of Land Management based on studies through March 1976, May 1977. 298 p, 61 fig, 88

*Alaska, Water resources, *Baseline studies, *Continental shelf, Descriptors: *Environmental effects, Resources development, *Continental shelf, Water pollution.

Identifiers: *Outer Continental Shelf, *Resources

availability, *Gulf of Alaska, Annual reports.

The first year's progress of an interdisciplinary environmental assessment program is summarized. The program, centered in the Northeast Gulf of Alaska, had two interrelated major objectives: to establish an environmental baseline in the region, against which development-related impacts might be detected and assessed, and to provide a basis for evaluating the primary impact of the petroleum development on the marine environment of the re-gion. For the first year of the NEGOA program, emphasis was placed on the first two of these research categories. Research on contaminant effects was incorporated in the second year, following a period of preparation extending over several months. The results of first year studies are out-lined in detail in this report. (Sinha-OEIS)

VLCC 'METULA' OIL SPILL, Texas A and M Research Foundation, College Sta-

For primary bibliographic entry see Field 5G. W77-11889

ASSESSMENT OF OFFSHORE DUMPING IN THE NEW YORK BIGHT, TECHNICAL BACKGROUND: PHYSICAL OCEANOGRAPHY, GEOLOGICAL OCEANOGRAPHY, CHEMICAL OCEANOGRAPHY, DISTRIBUTION OF THE PROPERTY OF THE PROPERT

National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and At-

mospheric Labs. For primary bibliographic entry see Field 5B. W77-11896

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT. VOLUME I: AN OVER-VIEW

North Carolina Univ. at Chapel Hill. Dept. of City and Regional Planning.

F. Parker, D. Brower, and D. Frankenberg.
Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-257 247, Price codes: A08 in paper copy, A01 in microfiche. North Carolina State University, Raleigh, Ser Grant Program Publication No. UNC-SG-76-05, April 1976. 166 p, 2 tab, 21 ref. SG-04-6-158-44054.

*Ecology, Lagoons, *Estuaries, ands, *North Carolina, Coasts, Descriptors: *Barrier islands,

zone *Coastal Identifiers: management, *Ecological determinants.

Natural science information relating to the North Carolina coastal area is given in this report fol-lowed by policy and management implications of that information. Appendices are bound separately as Volume II of this report, but the table of con-tents is included in this volume for reference. For the purpose of analysis, two major environmental systems are identified: the barrier island system and the lagoon-estuary system. While each is de-pendent on the other, they may be described in terms of the processes which are most essential to each. The value of the coastal environments is de-pendent on their ability to function together as part of an overall system. This is the basic policy implication of North Carolina's Coastal Area Manage-Act and is the basis for recommending specific tools by which development in the coastal area may be guided or controlled. (See also W77-11898) (Sinha - OEIS) W77-11897

ECOLOGICAL DETERMINANTS OF COASTAL AREA MANAGEMENT, VOLUME II: APPEN-

North Carolina Univ. at Chapel Hill. Urban Services Center for Urban and Regional Studies. D. Brower, F. Parker, D. Frankenberg, B. J.

Copeland, and R. Alden.

Available from the National Technical Information tion Service, Springfield, VA 22161 as PB-257 248, Price codes: A17 in paper copy, A01 in microfiche. North Carolina State University, Raleigh, Sea Grant Publication No. UNC-SG-76-05, April 1976. 426 p. SG-04-6-158-44054.

Descriptors: *Coasts, *Ecology, *Resources development, *Regulation, *Baseline studies, North Carolina, Barrier islands, Lagoons, Estuaries, Taxes, Planning.

*Coastal Management, Identifiers: zone *Environmental regulations, Land acquisition,

Volume II of this report consists of two appendices: 'Ecological Determinants' and 'Tools and Techniques for Coastal Area Management'. Appendix one discusses the coastal ecological systems--barrier islands and lagoon-estuary systems. Appendix two describes the tools and techniques for coastal area management, namely, land acqusistion, public spending, taxation, development regulation, environmental regulations, and regulation of development in areas of environmental concern. (See also W77-11897) (Sinha - OEIS) W77-11898

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 6TH QUARTERLY

National Marine Fisheries Service, Highlands, N. J. Middle Atlantic Coastal Fisheries Center. For primary bibliographic entry see Field 5C. W77-11899

A STUDY ON THE EFFECTS OF MAIN-TENANCE DREDGING ON SELECTED ECOLOGICAL PARAMETERS IN GULFPORT HARBOR, MISSISSIPPI.
Water and Air Research, Inc., Gainesville, Fla.

For primary bibliographic entry see Field 5C. W77-11901

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,

Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5C. W77-11903

7. RESOURCES DATA

7A. Network Design

METHODOLOGY FOR EVALUATING THE COST OF URBAN STORMWATER QUALITY

MANAGEMENT,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W77-12075

DESIGN OF SURFACE WATER DATA NET-WORKS FOR REGIONAL INFORMATION, Geological Survey, Reston, Va. Water Resources Div.

M. E. Moss.

Hydrological Sciences Bulletin, Vol 21, No 1, p 113-127, March 1976. 2 fig, 3 tab, 11 ref.

Descriptors: *Network design, Data collections, *Surface waters, *Regression analysis, *Regional analysis, Project planning, Methodology, Costs, Probability, Feasibility studies, Decision making. Identifiers: *Bays theorem.

The concept of equivalent years of record, a measure of parameter accuracy, in conjunction with regression analysis simulation leads to a methodology for specifying sets of numbers of gaging stations and lengths of record required to attain a prespecified level of regional streamflowparameter accuracy. This methodology can be used in network design to identify the number of stations and length of record that is the least cost methodology also indicates situations in which the criteria cannot be met without improving the underlying regionalization model. (Woodard-USGS) W77-12154 network that meets the accuracy criteria. The

7B. Data Acquisition

BIBLIOGRAPHY ON DISCHARGE MEASURE-

MENT TECHNIQUES, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 10C. W77-11594

RAIN RESULTING FROM MELTING ICE PAR-

Arizona Univ., Tucson. Inst. of Atmospheric Physics. For primar W77-11597 ry bibliographic entry see Field 2B.

MODEL OF THE DISTURBANCES IN HYDROLOGICAL SEQUENCES BASED ON THE METHOD OF DEMODULATION, Karlova Universita, Prague (Czechoslovakia). For primary bibliographic entry see Field 2E. W77-11602

A MODIFIED MERCURY TENSIOMETER, Ministry of Agriculture and Natural Resources, Nicosia (Cyprus). Dept. of Water Development. For primary bibliographic entry see Field 2G. W77-11615

ULTRASONIC NEBULIZATION TECHNIQUE FOR ADDING AQUEOUS SOLU-TIONS UNIFORMLY TO DRY SOILS, Montana State Univ., Bozeman. Dept. of Chemis-For primary bibliographic entry see Field 2G.

W77-11616

REMOTE SENSING OF WATER DEMAND IN-FORMATION. California Univ., Santa Barbara. Dept. of Geog-

raphy.
For primary bibliographic entry see Field 6D. W77-11635

REMOTE SENSING AND DEVELOPING COUNTRIES: POTENTIAL AND PROBLEMS IN THE

TRANSFER OF TECHNOLOGY, Clark Univ., Worcester, Mass. Graduate School of Geography. For primary bibliographic entry see Field 6B. W77-11639

RADIOACTIVITY IN MISSISSIPPI RIVER

WATER, Louisiana Water Resources Research Inst. Baton Rouge.
For primary bibliographic entry see Field 5A.

WASTEWATER FLOW MEASUREMENT IN

SEWERS USING ULTRASOUND,
Milwaukee Sewerage Commission, Wis.
R. J. Anderson, S. S. Bell, W. H. Vander Heyden, and W. K. Genthe.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 902, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-243, November 1976. 100 p, 50 fig, 7 ref, 4 append.

Descriptors: *Flow measurement, *Flowmeters, *Ultrasonics, *Combined sewers, *On-site tests, Instrumentation, Sewerage, Sewers, Flow rates, Flow control, Waste water treatment. Ultrasonic flowmeter. Milwau-Identifiers:

Accurate, reliable measurements of waste water flow are necessary to insure the efficient operation of a sewage system and to minimize outflow of raw sewage from a combined sewer system. A method for the measurement of sewage volume, depth, and velocity using ultrasonic probes has been investigated. Major elements in an ultrasonic metering system are the velocity meter, the height gauge, and an electronic signal processing unit. For the test conducted by the city of Milwaukee, costs for acquisition were considered sufficiently low for general use. Maintenance and installation requirements were not extraordinary. Depth measurements were accurate from 25% to full capacity in the sewer. Velocities were considered accurate over their full range at the test sites. Measurement interference was observed to be caused by entrained air, foam surfaces, and fluctuations in solids loading. It was suggested that existing flowmeters be used in conjunction with ultrasonic systems to further test the reliability of the ultrasonic probes. Recommendations for further investigations included the development of a portable monitoring unit, a method for operation in smaller line sizes (6-36 inch diameter), and a method for eliminating measurement interference. (Schulz-FIRL) W77-11759

SELECTED APPLICATIONS OF INSTRUMEN-TATION AND AUTOMATION IN WATER-TREATMENT FACILITIES, Raytheon Co., Portsmouth, R. I. For primary bibliographic entry see Field 5D. W77-11761

A CLOSING CLOSING, REPLICATE-SAMPLE, SEDI-California Univ., Davis. Div. of Environmental

Studies. For primary bibliographic entry see Field 2J. W77-11802

AN ELECTRON MICROSCOPY STUDY OF PARTICULATES PRESENT IN INDIVIDUAL RAINDROPS,

New Mexico Inst. of Mining and Technology, Socorro. Dept. of Metallurgical and Materials En-

gineering.
For primary bibliographic entry see Field 2B. W77-11821

COMPARATIVE UTILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES, American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div. R. Anderson, L. Alsid, and V. Carter.

In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Vol I-A. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, P 469-474, September 1975. 3 fig, 5 ref.

Descriptors: *Remote sensing, *Wetlands, *Satellites(Artificial), *Coastal marshes, *Satellites(Artificial), *Mapping, Methodology, Evaluation, Photog-raphy, Ecosystems, Estuarine environment. Identifiers: *Landsat-1 data, *Skylab, Digital data.

Skylab 190-A photography and LANDSAT-1 analog data have been analyzed to determine coastal wetland mapping potential as a near term substitute for aircraft data and a long term monitoring tool. The level of detail and accuracy of toring tool. The level of the data provides more accurate classification of wetland types, better delineation of freshwater marshes and more detailed analysis of drainage patterns. LANDSAT-1 analog data are useful for general classification, boundary definition and monitoring of human impact in wetlands. (See also W77-08408) (Woodard-USGS) W77-11874

AUTOMATIC CATEGORIZATION OF LAND-WATER COVER TYPES OF THE GREEN SWAMP, FLORIDA, USING SKYLAB MUL-TISPECTRAL SCANNER (S-192) DATA,

Geological Survey, Tampa, Fla.; Geological Survey, Miami, Fla. Water Resources Div.; and Bendix Aerospace Systems Div., Ann Arbor, Mich.

A. E. Coker, A. L. Higer, R. H. Rogers, N. J. Shah, and L. Reed.

Snan, and L. Reed. In: Proceedings of the NASA Earth Resources Survey Symposium, June 1975, Technical Session Presentations, Agriculture-Environment, Vol I-A. Report No NASA TM X-58168. Symposium held June 9-12, 1975, Houston, Texas, p 479-506, September 1975. 9 fig, 3 tab, 9 ref.

Descriptors: *Remote *Wetlands, sensing. *Satellites(Artificial), *Mapping, Photography, Hydrology, Swamps, Analytical techniques, Evaluation.

Identifiers: *Green Swamp(Fla), *Skylab data,

Digital tape data.

The Green Swamp, the fountainhead of five major rivers, a broad flat wetland comprising 2,253 square kilometers (870 square miles) of the central ighlands of the Florida peninsula was chosen as a Skylab Earth Resources Experiment Package (EREP) test site. This report summarizes the (EREP) test site. This report summarizes the techniques used and the results achieved in the successful application of Skylab Multispectral data for the automatic categorizing and mapping of land-water cover types in the Green Swamp. Data was provided from NASA Skylab pass number 10 on 13 June 1973. Significant results achieved included the automatic mapping of a pine-category. cluded the automatic mapping of a nine-category and a three-category land-water cover map of the Green Swamp. The land-water cover map was used to make interpretations of a hydrologic condition in the Green Swamp. This type of use marks a significant breakthrough in the processing and utilization of EREP S-192 data. (See also W77-08408) (Woodard-USGS) W77-11875

REMOTE SENSING OF OIL SLICKS WITH MICROWAVE RADIOMETER, Helsinki Univ. of Technology, Otaniemi (Finland).

For primary bibliographic entry see Field 5A. W77-11891

LANDSAT OBSERVATIONS OF OCEAN DUMP PLUME MOVEMENT AND DISPERSION, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5B.

W77-11894

CIRCULATION OBSERVATIONS IN THE LOUISIANA BIGHT USING LANDSAT IMAGERY Louisiana State Univ., Baton Rouge. Center for

Wetland Resources. For primary bibliographic entry see Field 2L. W77-11895

APPLICATION OF LANDSAT-2 TO THE MANAGEMENT OF DELAWARE'S MARINE AND WETLAND RESOURCES,

Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5C. W77-11903

CHANGES IN AQUATIC MACROPHYTES AC-COMPANYING PHOSPHORUS REDUCTION IN A EUTROPHIC LAKE IN NEW YORK STATE: AN ASSESSMENT BASED ON REMOTELY SENSED AND OTHER DATA, Cornell Univ., Ithaca, N.Y. Center for Environ-

mental Research. For primary bibliographic entry see Field 5A. W77-11940

EVALUATION OF PORCELAIN CUP SOIL WATER SAMPLERS FOR BACTERIOLOGICAL

Florida Univ., Gainesville. Dept. of Microbiology; and Florida Univ., Gainesville. Dept. of Soil

For primary bibliographic entry see Field 5A. W77-11968

A METHOD OF PRECALIBRATING RE-OX-YGENATION RATES IN EXPERIMENTAL

Colorado Cooperative Fishery Unit, Fort Collins. W. J. McConnell, and U. T. Jackson. Transactions of the American Fisheries Society, Vol. 105, No. 2, p 343-346, 1976. 2 fig., 5 ref.

Descriptors: *Design, *Methodology, Technology, *Oxygen, *Research equipment, Oxygenation, Oxygen demand, Oxygen requirements, Respiration, Dissolv Dissolved oxygen, Laboratory equipment,

Identifiers: *Re-oxygenation rates, Precalibration procedure, Oxygen consumption.

A precalibration procedure was outlined that allowed sufficient re-oxygenation to balance oxygen demand in static containers used to hold small aquatic animals. The procedure was based on predicting the rate of controlled turbulence at which re-oxygenation balanced oxygen consumption at oxygen concentrations below saturation. (Klein) W77-12051

AN EMERGENCY WATER SUPPLY FOR SMALL AQUARIUM SYSTEMS,

Puerto Rico Nuclear Center, Mayaguez K. W. Watters, and T. E. Prinslow Transactions of the American Fisheries Society, Vol 105, No 2, p 347-348, 1976. 1 tab, 1 ref.

Descriptors: *Aquaria, *Equipment, *Laboratory equipment, *Water supply, *Safety factors, Methodology, Aquiculture, Technology, Research facilities, Research and development, Design. Identifiers: *Aquarium pumps, *Emergency water superline. supply.

An emergency standby pumping system for small aquariums was described, which was independent of the main aquarium pumping system, has a self-contained power supply, and starts and resets automatically. (Katz) W77-12061

EXTENDED FIELD USE OF SCREEN-COVERED THERMOCOUPLE PSYCHROME-TERS.

Intermountain Forest and Range Experiment Station, Ogden, Utah.
For primary bibliographic entry see Field 2G.
W77-12116

NEW TECHNIQUE FOR MEASURING THE WATER POTENTIAL OF DETACHED LEAF SAMPLES, Intermountain Forest and Range Experiment Sta-

tion, Ogden, Utah. R. W. Brown.

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Agronomy Journal, Vol. 68, No. 2, p 432-434, March-April 1976. 4 fig, 7 ref.

Descriptors: *Evaporation, *Sampling, Leaves, Measurement.

Identifiers: Leaf water potential, *Leaf samples.

Evaporative losses and contamination in sample disks after they are cut from plant leaves often cause errors in measurements of water potential. A new technique for collecting detached leaf disks to measure water potential eliminates most of the errors associated with other methods. The leaf errors associated with other methods. Inc lear cutter contains a double-junction Peltier ther-mocouple psychrometer. When a leaf disk is removed from the plant, it can be sealed im-mediately against the cavity containing the psychrometer. (Skogerboe-Colorado State) W77-12117

EVALUATION OF AN ELECTRONIC FOLIOMETER TO MEASURE LEAF AREA IN CORN AND SOYBEANS, California Univ., Davis. Dept. of Land, Air and

Water Resources

Agronomy Journal, Vol. 68, No. 2, p 434-436, March-April 1976. 2 fig, 1 tab, 5 ref.

Descriptors: *Corn(Field), *Soybeans, Measure-

ment, Instrumentation, Leaves.
Identifiers: *Leaf area measurement, Electronic foliometer, Measurement error.

Known areas were measured with an electronic foliometer to determine the errors involved with this instrument. Good agreement between measured and known areas was found and there was high accuracy and precision for both the conveyor belt and sheath method. Tests were made comparing the foliometer, a planimeter, and maximum length times maximum width (LW) for soybeans and comparing foliometer and LW for corn. There was close agreement between planimeter and foliometer measurements for soybeans (r = 0.99). The foliometer compared favorably with LW for corn (r = 0.96). Coefficients for converting LW measurements to leaf areas were determined for soybeans and three corn hybrids. (Skogerboe-Colorado State) W77-12118

SIMULATION MODEL FOR NUTRIENT UP-TAKE FROM SOIL BY A GROWING PLANT ROOT SYSTEM,

Purdue Univ., Lafayette, Ind. Dept. of Agronomy. For primary bibliographic entry see Field 2G. W77-12119

A SYSTEM AND PROGRAM FOR MONITOR-ING CO2 CONCENTRATION, GRADIENT, AND FLUX IN AN AGRICULTURAL REGION,

Nebraska Univ., Lincoln. Dept. of Agricultural

N.J. Rosenberg, and S. B. Verma. Agronomy Journal, Vol 68, No 2, p 414-418, March-April 1976. 3 fig, 6 ref.

Descriptors: *Photosynthesis, *Carbon dioxide, Nebraska, Sampling, Wind speed, Air tempera-ture, Data collections, *Monitoring.

Because of the changing global concentration of carbon dioxide and the possible effects of this change on photosynthetic activity worldwide, a program has been developed for monitoring at-mospheric carbon dioxide concentration and gradients representative of a large agricultural region. The program is carried out at Mead, Nebraska. A meteorological tower is equipped with sampling intakes at various elevations up to 16 m, through which air is grawn to the laboratory for analysis with infra-red gas analyzers. An auto-matic calibration system has been developed to permit hourly checks of analyzer performance. Profiles of wind speed and air temperature are also measured. The equipment, the calibration techniques, and the errors associated with the measurements of CO2 concentration and gradients are described. Some initial observations of CO2 concentrations an fluxes are presented. (Skogerboe-Colorado State) W77-12120

ALGORITHM FOR SOLAR RADIATION ON

MOUNTAIN SLOPES, Forest Service (USDA), Franklin, N.C. Coweeta Hydrologic Lab. L. W. Swift, Jr.

Water Resources Research, Vol 12, No 1, p 108-112, February 1976. 2 fig, 1 tab, 17 ref.

Descriptors: *Algorithms, *Solar radiation, Computer models, Model studies, Mountains, Slopes. Identifiers: *Mountain slopes.

A generalized algorithm provides the daily total of potential solar radiation on any sloping surface at any latitude. The algorithm can be coded as subroutines of a computer model that requires solar radiation as a variable. The required inputs are Julian dates and the latitude, inclination, and aspect of the slope. In addition to computing potential solar radiation, the routine provides estimates of actual radiation on any slope on the basis of measured solar radiation for a nearby horizontal surface that has the same cloud cover. (Skogerboe-Colorado State)
W77-12135

SIMULTANEOUS PASSIVE AND ACTIVE MICROWAVE OBSERVATIONS OF NEAR-SHORE BEAUFORT SEA ICE, Geological Survey, Tacoma, Wash. Water

Resources Div. For primary bibliographic entry see Field 2C. W77-12157

DEVELOPMENT OF ORGANIC SOLUTE AND TOTAL ORGANIC CARBON MONITORS, Life Systems, Inc., Cleveland, Ohio. For primary bibliographic entry see Field 5A. W77-12199

DISPOSABLE ELECTRODE CHAMBER FOR MEASURING OPERCULAR MOVEMENTS OF FATHEAD MINNOWS, Environmental Research Lab.-Duluth, Minn.

For primary bibliographic entry see Field 5A. W77-12206

TEMPERATURE SAFETY DEVICE FOR AQUATIC LABORATORY SYSTEMS, Environmental Protection Agency, -Duluth, Minn.

D. L. DeFoe. The Progressive Fish-Culturist, Vol 39, No 3, p 131, 1977. 1 fig.

Descriptors: Design, *Design criteria. Descriptors: Design, "Design criteria, "Temperature, "Safety factors, "Research equip-ment, "Laboratory tests, "Temperature control, Research and development, Equipment, Methodology, Aquiculture. Identifiers: "Temperature safety device. A simple, inexpensive temperature safety device was described that stops water flow when the temperature-controlling system in aquatic rearing and holding facilities failed and set temperature limits were exceeded. The design criteria and operation of the device were signer. (**Letter*) of the device were given. (Katz)

ELECTRONIC CONTROLLER FOR PRODUCING CYCLIC TEMPERATURES IN AQUATIC STUDIES,

Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab. P. R. Abell, L. B. Richardson, and D. T. Burton. The Progressive Fish-Culturist, Vol 39, No 3, p 139-141, 1977. 1 fig, 2 tab, 6 ref.

Descriptors: *Equipment, Research and develop-ment, Design, *Research equipment, ment, Design, *Research equipment, *Temperature, *Temperature control, *Electrical equipment, Design criteria, Methodology, Laboratory tests, Aquicul-

Identifiers: Cyclic temperatures, *Electronic temperature controller.

Construction of an electronic device for the production of sine wave cyclic temperatures in aquatic systems was described. The controller was assembled from readily available parts and provided reliable temperature oscillations. Applications and modifications were discussed. (Katz) W77-12208

7C. Evaluation, Processing and Publication

HYDROGEOLOGY OF THE IOSEGUN LAKE AREA, ALBERTA,
Research Council of Alberta, Edmonton For primary bibliographic entry see Field 2F. W77-11587

HYDROGEOLOGY OF THE MOUNT ROBSON-WAPTTI AREA, ALBERTA, Research Council of Alberta, Edmonton. For primary bibliographic entry see Field 2F. W77-11588

HYDROGEOLOGY OF THE WHITECOURT AREA, ALBERTA, Research Council of Alberta, Edmonton For primary bibliographic entry see Field 2F. W77-11589

LAKE ONTARIO ATLAS: CHEMISTRY, New York Sea Grant Inst., Albany. For primary bibliographic entry see Field 5C.

THE INVESTIGATION OF SEWER NETWORKS

BY COMPUTER,
London Borough of Hammersmith (England).
Directorate of Engineering.
For primary bibliographic entry see Field 5G.
W77-11670

SOME REMARKS ON COMPUTER MODELING OF COASTAL FLOWS, California Univ., Berkeley. Dept. of Civil En-For primary bibliographic entry see Field 2L. W77-11781

SPECIAL FLOOD HAZARD INFORMATION: ALAMEDA AND LAS CRUCES ARROYOS, LAS CRUCES, NEW MEXICO. Army Engineer District, Albuquerque, N. Mex. For primary bibliographic entry see Field 4A. W77-11834

Field 7—RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

FLOOD PLAIN INFORMATION: FRANK-STOWN BRANCH JUNIATA RIVER, Army Engineer District, Baltimore, Md. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: BUFFALO CREEK, N.Y. IN THE TOWNS OF ELMA AND WEST SENECA.

Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 4A. W77-11836

FLOOD PLAIN INFORMATION: CAZENOVIA CREEK, NEW YORK, CITY OF BUFFALO AND TOWN OF WEST SENECA. Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: RIVER ROUGE, MICHIGAN, MAIN, EVANS DITCH, AND FRANKLIN BRANCHES IN WAYNE AND OAKLAND COUNTIES.

Army Engineer District, Detroit, Mich For primary bibliographic entry see Field 4A. W77-11838

W77-11837

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, FARMINGTON, MICHIGAN. Army Engineer District, Detroit, Mich. For primary bibliographic entry see Field 4A. W77-11839

FLOOD PLAIN INFORMATION: ATLANTA, TEXAS: BLACK BAYOU AND TRIBUTARIES. Army Engineer District, New Orleans, LA. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: CHADAKOIN JAMESTOWN-FALCONER. VORK

Army Engineer District, Pittsburgh, Pa. For primary bibliographic entry see Field 4A.

FLOOD PLAIN INFORMATION: ANTELOPE CREEK, SECRET RAVINE AND TRIBUTA-RIES, ROCKLIN, CALIFORNIA. Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 4A. W77-11842

BLACKSMITH FORK AND SPRING CREEK FLOOD PLAIN INFORMATION, MILLVILLE,

Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 4A. W77-11843

FLOOD PLAIN INFORMATION: ANDROSCOG-GIN AND DEAD RIVERS, LEEDS, MAINE. Army Engineer District, Waltham, Mass. New England Div. For primary bibliographic entry see Field 4A. W77-11844

FLOOD PLAIN INFORMATION: MERRIMACK, SHAWSHEEN, AND SPICKET RIVERS, LAWRENCE, METHUEN, ANDOVER AND NORTH ANDOVER, MA.
Army Engineer District, Waltham, Mass. New En-

gland Div.

For primary bibliographic entry see Field 4A. W77-11845

FLOOD PLAIN INFORMATION: PENOBSCOT AND STILLWATER RIVERS, OLD TOWN AND MILFORD, MAINE.

Army Engineer District, Waltham, Mass. New England Div. For primary bibliographic entry see Field 4A. W77-11846

FLOOD PLAIN INFORMATION: SACO RIVER, FRYEBURG, MAINE.

Army Engineer District, Waltham, Mass. New En-For primary bibliographic entry see Field 4A. W77-11847

USER MANUAL FOR SEWER AND WATER AC-COUNTS PROCESSING MODULE. For primary bibliographic entry see Field 5G. W77-11856

WATER AND SEWER RATES IN MINNESOTA, Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics. For primar W77-11868 mary bibliographic entry see Field 6C.

COMPARATIVE LITILITY OF LANDSAT-1 AND SKYLAB DATA FOR COASTAL WETLAND MAPPING AND ECOLOGICAL STUDIES,

American Univ., Washington, D. C. Dept. of Biology; and Geological Survey, Reston Va. Water Resources Div. For primary bibliographic entry see Field 7B. W77-11874

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975-VOLUME 2. SOUTHERN

Geological Survey, Tallahassee, Fla. Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 660, (2 books), Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-75-2, May 1976. 1451 p, (two reports), 26 fig, 3 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites. Identifiers: Southern Florida.

Water resources data for the 1975 water year in south Florida are contained in two publications (pages 1 to 770 and pages 771 to 1451). The data consist of discharge records for 85 streams, stageonly records for 82 streams, elevations for 35 lakes, and daily water-level measurements for 239 wells. Water quality data for more than 400 surface-water sites and 600 wells are included. Also, included are miscellaneous measurement, flood profile and crest-stage partial records. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS) W77-11876

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1975-VOLUME 1. NORTHERN FLORIDA. Geological Survey, Tallahassee, Fla. Water

Resources Div.

Available from the National Technical Inform tion Service, Springfield, VA 22161 as PB-254 659, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-75-1, June 1976. 769 p, 36 fig, 5 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments. Identifiers: Northern Florida.

Water resources data for Florida, for the 1975 water year, are in three volumes as follows: Volume 1. Northern Florida; Volume 2. Southern Florida which contains Vol 1 (pages 1 to 770) and Vol 2 (pages 771 to 1451); and Volume 3. West-Central Florida. This volume for northern Florida consists of discharge records for 100 streams, consists of discharge records for 100 streams, stage-only records for one stream, elevations for 47 lakes, and daily water-level measurements for 274 wells. Water quality data for more than 125 surface-water sites and 300 wells are included. Also, included are miscellaneous measurement and crest-stage partial records. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local. State and Federal agencies in cooperating local, State and Federal agencies in Florida. (Woodard-USGS) W77-11877

POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, NORTH FLORIDA, MAY 1976,

Suwannee River Water Management District, Fla.; and Geological Survey, Tallahassee, Fla. Water

D. W. Fisk, and J. C. Rosenau. Water Resources Investigation 77-1 (open-file report), 1977. 1 sheet.

Descriptors: *Aquifers, *Potentiometric level, *Observation wells, *Mapping, *Contours, Florida, Gulf coastal plain, Water levels, *Potentiometric level, Hydrogeology.

Identifiers: *North-Central Florida, *Floridan aquifer, Suwannee River Water Management District.

A map showing the potentiometric surface of the Floridan aquifer was prepared for that area north and west of Gainesville to near Tallahassee, Florida. Contoured at 10-foot (3.048-meter) intervals and at a scale of 1:500,000, the map illustrates the altitude to which water would rise in tightly cased wells that tap the aquifer as of May 1976. The sites of observation wells used as control are shown. The potentiometric surface slopes southwest toward the Gulf of Mexico and to the Suwannee River and its tributary, the Santa Fe River. (Woodard-USGS) W77-11878

DIGITAL MODEL ANALYSIS OF THE PRIN-CIPAL ARTESIAN AQUIFER, SAVANNAH, GEORGIA AREA, Doraville, Ga. Geological Survey,

Resources Div. H. B. Counts, and R. E. Krause.

Water-Resources Investigations 76-133 (open-file report), 1976. 4 sheets, 19 ref.

Descriptors: *Model studies, *Artesian aquifers, *Anuifer systems, *Hydraulic models, *Maps, *Aquifer systems, *Hydraulic models, *Map Data collections, Water level fluctuations, Pum ing, Drawdown, Water management(Applied), Evaluation, Projections, *Georgia. Identifiers: *Savannah area(Ga).

A digital model of the principal artesian aquifer has been developed for the Savannah, Georgia, area. The model simulates the response of the aquifer system to various hydrologic stresses. Model results of the water levels and water-level changes are shown on maps. Computations may be extended in time, indicating changes in pumpage were applied to the system and probable results calculated. Drawdown or water-level differences were computed, showing comparisons of different water management alternatives. (Woodard-USGS) W77-11879

HYDROLOGIC UNIT MAP--1974, STATE OF LOUISIANA.

Geological Survey, Reston, Va. Water Resources

Available from U.S. Geological Survey, Reston, VA, 22092, price \$1.25. Hydrologic Unit Map of Louisiana, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Louisiana, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(La), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Louisiana that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-11880

HYDROLOGIC UNIT MAP-1974, STATE OF ARKANSAS.

Geological Survey, Reston, Va. Water Resources Div.

Available from U S Geological Survey, Reston, VA., 22092, price \$1.00. Hydrologic Unit Map of Arkansas, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Arkansas, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(Ark), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Arkansas that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)

HYDROLOGIC UNIT MAP-1974, STATE OF KENTUCKY.

Geological Survey, Reston, Va. Water Resources Div.

Available from U.S. Geological Survey, Reston, VA., 22092, price \$1.25. Hydrologic Unit Map of Kentucky, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Kentucky, Water resources, Data collections, Planniag, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(Ky), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

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This map and accompanying table show Hydrologic Units in Kentucky that are basically hydro-

graphic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-11882

HYDROLOGIC UNIT MAP-1974, STATE OF MISSISSIPPL

Geological Survey, Reston, Va. Water Resources

Available from U.S. Geological Survey, Reston, VA., 22092, price \$1.25. Hydrologic Unit Map of Mississippi, 1977. 1 sheet.

Descriptors: *Maps, Hydrology, *Mississippi, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(Miss), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Mississippi that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Countil for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-11883

HYDROLOGIC UNIT MAP-1974, STATE OF TENNESSEE.

Geological Survey, Reston, Va. Water Resources

Available from U.S. Geological Survey, Reston, VA. 22092, price \$1.00. Hydrologic Unit Map of Tennessee, 1976. 1 sheet.

Descriptors: *Maps, *Hydrology, *Tennessee, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(Tenn), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Tennessee that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)

HYDROLOGIC UNIT MAP-1974, STATE OF MISSOURI.

Geological Survey, Reston, Va. Water Resources Div. Available from U.S. Geological Survey, Reston, VA. 22092, price \$1.25. Hydrologic Unit Map of Missouri, 1977. 1 sheet.

Descriptors: *Maps, *Hydrology, *Missouri, Water resources, Data collections, Planning, Hydrologic systems, Regions, Land resources. Identifiers: *Hydrologic unit maps(Mo), *Hydrologic boundaries, Subregions, Accounting units, Cataloging units.

This map and accompanying table show Hydrologic Units in Missouri that are basically hydrographic in nature. The Cataloging Units shown will supplant the Cataloging Units previously used by the U.S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U.S. Water Resources Council for comprehensive planning, including the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning, the Accounting Units are those currently (1974) in use by the U.S. Geological Survey for managing the National Water Data Network. (Woodard-USGS) W77-11885

DIGITAL SIMULATION OF A DRAINAGE

Madras Univ., Guindy (India). Dept. of Hydraulics and Water Resources. For primary bibliographic entry see Field 2A. W77-12082

DESIGNING CONCEPTUAL CATCHMENT
MODELS FOR AUTOMATIC FITTING

Ministry of Works, Wellington (New Zealand). For primary bibliographic entry see Field 2A. W77-12084

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1977.

Geological Survey, Austin, Tex. Water Resources Div.

For primary bibliographic entry see Field 4A. W77-12151

DESIGN OF SURFACE WATER DATA NET-WORKS FOR REGIONAL INFORMATION, Geological Survey, Reston, Va. Water Resources

Div. For primary bibliographic entry see Field 7A. W77-12154

HYDROLOGIC DATA FOR NORTH CREEK TRINITY RIVER BASIN, TEXAS, 1975,

Geological Survey, Austin, Tex. Water Resources Div. C. C. Kidwell.

Open-file report 76-724, April 1977. 50 p, 2 fig, 3 tab.

Descriptors: "Hydrologic data, "Small watersheds, "Rainfall-nunoff relationships, "Streamflow, "Flood control, "Texas, Storms, Flood protection, Watershed management, Gaging stations, Flow rates. Identifiers: "North Creek(Tex), "Trinity River basin(Tex).

This report contains the rainfall, runoff, and storage data collected during the 1975 water year for the 21.6-square-mile area above the stream-gaging station North Creek near Jacksboro, Texas. The weighted-mean rainfall in the study area during the water year was 39.01 inches, which is greater than the 18-year average of 30.21 inches for the period 1958-75. Monthly rainfall totals ranged from 1.04 inches in November to 7.94 inches in May. The mean discharge for 1975 at the

Field 7-RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

stream-gaging station was 5.98 cfs, compared with the 14nyear (1957-70) average of 5.75 cfs. The an-nual runoff from the basin above the stream-gag-ing station was 4,330 acre-feet or 3.76 inches. Three storms were selected for detailed computations for the 1975 water year. The storms occurred on Oct. 30-31, 1974, May 2, 1975, and Aug. 26, 1975. Rainfall and discharge were computed on the basis of a refined time breakdown. Patterns of the storms are illustrated by hydrographs and mass curves. A summary of rainfall-runoff data is tabulated. There are five floodwater-retarding structures in the study area. These structures have a total capacity of 4,425 acre-feet below flood-spillway crests and regulate streamflow from 16.3 square miles, or 75 percent of the study area. A summary of the physical data at each of the floodwater-retarding structures is included. (Woodard-W77-12155

MAXIMUM FLOODFLOWS IN THE CONTER-

MINOUS UNITED STATES, Geological Survey, Menlo Park, Calif. Water Resources Div.

J. R. Crippen, and C. D. Bue.

For sale by Supt. of Documents, GPO. Washington DC 20402, price \$1.70. Water-Supply Paper 1887, 1977. 52 p, 19 fig, 1 tab, 4 ref.

*Floods. discharge. *Maximum probable flood, *United States, Gaging stations, Streamflow, Flow rates, Drainage area, Hydrologic data, Data collections. Identifiers: *Conterminous United States.

Peak floodflows from thousands of observation sites within the conterminous United States were studied to provide a guide for estimating potential maximum floodflows. Data were selected from 883 sites with drainage areas of less than 10,000 square miles (25,900 square kilometers) and were grouped into regional sets. Outstanding floods for each region were plotted on graphs, and envelope curves were computed that offer reasonable limits for estimates of maximum floods. The curves indicate that floods may occur that are two or three times greater than those known for most streams. (Woodard-USGS)

W77-12156

DRAINAGE COST AND SUBSURFACE HYDROLOGIC MODEL,

Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Agricultural Engineering. For primary bibliographic entry see Field 4B. W77-12166

8. ENGINEERING WORKS

8A. Structures

DUAL TECHNOLOGICAL S WATER AND GRAIN STORAGE. SYSTEMS IN Wunderman Foundation, New York For primary bibliographic entry see Field 6B. W77-11638

8B. Hydraulics

STATISTICAL PROCEDURES FOR BED FORM ANALYSIS, Colorado State Univ., Fort Collins. Dept. of Civil

eering.

K. Mahmood, and H. Ahmadi-Karvigh.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-260 642, Price codes: All in paper copy, A01 in microfiche. Report CER75-76KM-HAK41, July 1976. 247 p, 46 fig, 6 tab, 35 ref. NSF ENG72-00274 OIP75-15976. Descriptors: *Streambeds, *Profiles, *Channel morphology, *Data processing, *Alluvial channels, Statistics, Computer programs, Potamology, Roughness(Hydraulic), Foreign countries, Foreign research, Waves(Water). Identifiers: *Bed ripples, *Pakistan, *Bed forms,

Procedures were outlined for preprocessing of data for spectral and zero crossing analyses of bed form wave characteristics. Methods of testing the statistical distribution of wave characteristics record also were included. Data on bed form characteristics from alluvial rivers were collected from link canals of Pakistan. The bed forms were mapped with single and multiple transducer ultra-sonic sounders. The bed form data thus collected presented a wide range of wavelengths. The smaller waves of the order of few flow depths are important in the context of resistance to flow. To isolate the bed forms related to individual phenomena and to measure their characteristics, it was necessary to detrend and to filter the data becation of the methodology developed was illustrated by using the link canal data. Computer programs were included with user's manual. (Bhowmik-ISWS) fore analyzing for wave characteristics. The appli-W77-11582

BREAKING WAVE CRITERION ON A SLOP-

Navai Postgraduate School, Monterey, Calif. R. M. Smith.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A032 323, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, Sept. 1976. 97 p, 14 fig, 1 tab, 42 ref, 2 append.

Descriptors: *Waves(Water), *Shallow water, *Hydrodynamics, *Beaches, *Velocity, Slopes, Laboratory tests, Equations, Mathematical stu-

Identifiers: *Wave theory, *Braking waves, Perturbation technique, Long waves.

The various wave theories, theoretical breaking criteria, and derived breaking criteria were reviewed for shallow water waves. To account for the nonlinear hydrodynamics present in a shallow water wave breaking on a beach with a sloping bot-tom, the perturbation technique of Iwagaki and Sakai was used to derive a second order expression for the horizontal water particle velocity for long waves. The kinematic breaking criterion was applied to the derived wave phase speed and horizontal water particle velocity values to establish breaking. The results indicated that the ratios of elevation of free surface referenced to still water level at breaking point to deep water wave length (N sub b/L sub o) and the depth of water referenced to still water level at breaking point to deep water wave height (h sub b/H sub o) provide reliable breaking criteria. Each of the parameters was dependent only upon beach slope and H sub o/L sub o. Theoretically derived values for h sub b/H sub o compared favorably with field measurements and offered improvement over previous theory. Predicted breaking depths were less than those present in experimental data, susggesting extension to higher orders may be war-ranted. (Bhowmik-ISWS) W77-11585

FINAL REPORT OF THE TASK COMMITTEE

ON BRANCHING CONDUITS,
American Society of Civil Engineers, New York.
J. V. Williamson, T. J. Rhone, E. Reeves, and J. R. Villemonte.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY7, Proceedings Paper 13082, p 681-684, July 1977.

Descriptors: *Junctions, *Pipe flow, *Energy loss, *Abstracts, Pipelines, Flow, Flow resistance Hydraulics, Flow friction, Conduits, Publications.

Identifiers: *Branching conduits, Manifolds.

This report presented a final summary of the Task Committee on Branching Conduits and was in-tended to provide reference to the publications resulting from the committee's work. The pur-poses of investigations on branches are basically to determine energy losses; pressure fluctuations including cavitation; and the relation of hydraulic losses to structural considerations in large conduits, particularly as they influence the overall economics. Generally, losses at branches are relatively minor, but they become significant under certain conditions, such as low-head cooling water systems in power plants, and in hydroelectric conduits where the value of power is considerable. In these cases, individual efforts are made to reduce losses by modifying the branches. On the other hand, heating and air conditioning systems usually consist of a variety of standard ducts and bends selected and assembled to meet a particular specification. Higher losses often are tolerated in the interest of ease of manufacture or assembly. The results from the investigations and research ine results from the investigations and research conducted by the Task Committee were presented in six papers published by ASCE. (See also W71-10178, W73-10608, and W75-08805-W75-08807) (Humphreys-ISWS) W77-11590

SOME BASIC CONCEPTS ON FLOW IN BRANCHING CONDUITS,

Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY7, Proceedings Paper 13051, p 685-697, July 1977. 5 fig, 27 ref, 1 append.

Descriptors: *Junctions, *Pipe flow, *Energy loss, Estimating, Head loss, Roughness(Hydraulic), Flow friction, Pipelines, Conduits, Flow resistance, Analytical techniques, Theoretical analysis, Moody resistance diagrams, Laminar flow, Turbulent flow, Flow, Hydraulics, Transitional flow, Laboratory equipment. Identifiers: *Branching conduits, Manifolds.

Phenomenological explanations were given of the mechanisms associated with 'nondisturbed' and 'disturbed' flows in branching conduits, as well as straight ducts. Four categories of flow conditions were defined, covering situations ranging from deep in the laminar regime (R less than 10) to high in the complete turbulent regime. Analytical concepts were reviewed, and guidelines were presented for the construction of a standardized laboratory test apparatus. Protocols were presented to aid the design engineer in the calculation of energy losses in pipe flow resulting from fittings, with particular reference to the combini and dividing flows for pipe tees, branches, and manifolds. (See also W71-10178, W73-10608, and W75-08805-W75-08807) (Humphreys-ISWS) W77-11591

TURBULENT FLOW IN VERY NONCIRCULAR CONDUIT.

Research Council of Alberta, Edmonton. Trans portation and Surface Water Engineering Div. R. Gerard, and W. D. Baines.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13105, p 829-842, August 1977. 8 fig, 14 ref, 2 append.

Descriptors: *Boundary processes, *Turbulence, Velocity, *Shear drag, *Reynolds number, Laboratory tests, Analytical techniques, Hydrau-lics, Pipe flow, Measurement. Identifiers: *Secondary flow, Noncircular con-

duit. Boundary shear. Secondary flows in noncircular conduits affect the average flow velocity. The inclusion of secondary

Rock Mechanics and Geology—Group 8E

flows in the case of a square duct eliminates the difference between measured and predicted average flow velocity. A laboratory experiment was conducted to measure the friction factor variation with Reynolds number and the mean velocity and boundary shear distributions for a smooth conduit having a cross section similar to that formed between circular rods stacked in a square pattern. This section has a considerable shape effect because of the cusped corners. Head loss measurements indicated significant difference between the friction factor in the conduit shape and the friction factor in a circular pipe. The velocity distributions along normals to the wall fol-lowed the universal distribution reasonably well. The observed velocity and boundary shear distributions were compared with those calculated for the conduit shape using a finite element algorithm neglecting secondary flow effects. The difference between the measured and the calculated the conduit of the condu lated velocity distributions was used to estimate the magnitude of the secondary flow in the conduit shape. (Singh-ISWS) W77-11592

NUMERICAL MODEL FOR DISCRETE SET-

TLING, Technical Univ. of Istanbul (Turkey). Dept. of Civil Engineering. H. Z. Sarikaya.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13150; p 865-876, August 1977. 5 fig, 11 ref, 2 append.

*Turbulence, Numerical analysis, Settling basins, Foreign research, Velocity, Open channel flow, Uniform flow, Sediment transport. Identifiers: *Discrete settling.

Identifiers: *Discrete settling, Stability analysis, Isotropic turbulence, Logarithmic velocity distribution.

A numerical method of solution was given for the differential equation describing the discrete set-tling in two-dimensional uniform and turbulent n-channel flow. Stability condition of the finite difference equations was derived by applying linear stability analysis. By neglecting the effect of longitudingal turbulent diffusion, settling efficiency generally is expressed in terms of two independent variables. Further, it is assumed that turbulence is isotropic and solid particles behave like a fluid mass. Three sets of solutions were obtained for uniform, logarithmic, and parabolic velocity distributions in vertical direction. However, the results of the last two were given graphically. In the case of uniform velocity distribution, results of numerical solution were compared with Camp's solutions, and high accuracy was obtained. The effect of turbulence and velocity distribution was shown. Solutions obtained for the logarithmic velocity distribution, which was verified experimentally, were suggested for practical applica-tions. (Singh-ISWS) W77-11593

BEHAVIOR OF AUXILIARY INTAKE OF RAM-

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GANGA DAM AT LOW LEVELS, Irrigation Commission, Lucknow (India). Design and Research.

H. Mohan, H. D. Sharma, D. V. Varshney, and S.

Journal of the Hydraulics Division, Proceedings, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings paper 13091, p 753-762, July 1977. 6 fig.

Descriptors: *Trash racks, *Intakes structures, *Hydraulics, *Model studies, *Dams, Reservoir operation, Diversion tunnels, Air entrainment, Hydraulic valves, Irrigation water, Foreign counes, Foreign research.

Identifiers: *Ramganga Dam(India), *India, Hemi-spherical trash-racks, Auxiliary intake.

One of the diversion tunnels at the Ramganga Dam, 418 ft high earth and rock fill dam in Uttar Pradesh, was designed to be used as a low-level auxiliary outlet for irrigation releases during the closure period of the powerhouse or for other reasons depleting the reservoir below the dead storage level. The intake structure is provided with a hemispherical trash-rack weighing 8 tons, and vertical trash-racks are provided between the piers supporting the hemispherical rack. In June 1975, when the auxiliary outlet was being run, the hemi-spherical trash-rack was lifted up, displaced from s seat, and subsequently sucked into the tunne Model studies were conducted to investigate the causes of the trash-rack displacement and of the auxiliary intake behavior at low reservoir levels The studies indicated that the release of air-water spouts resulting from escape of locked air in the tunnel through the intake shaft could have lifted up and displaced the rack. In order to avoid air entry into the tunnel, a regulation curve for valve operation was suggested to prevent such recurrence in the future. (Singh-ISWS)

COMPUTATION OF BACKWATER AND DISCHARGE AT WIDTH CONSTRICTIONS OF

DISCHARGE AT WIDTH CONSTRUCTIONS OF HEAVILY VEGETATED FLOOD PLAINS, Geological Survey, Bay Saint Louis, Miss. Water Resources Div.; Geological Survey, Columbus, Ohio. Water Resources Div.; Geological Survey, Jackson, Miss. Water Resources Div.; and Geological Survey, Baton Rouge, La. Water Resources

For primary bibliographic entry see Field 4C. W77-12152

8C. Hydraulic Machinery

AXIAL-FLOW PUMPS FOR DEEP WATERS. Mono Pumps Africa Pty Ltd. (South Africa). Municipal Administration and Engineering, Vol 40, No 491, p 78-80, July 1976. 3 fig, 1 tab.

Descriptors: *Axial flow, *Pumps, Water resources, Groundwater, Boreholes, *Design criteria, Suspended solids, Centrifugal pumps,

The use of small diameter boreholes to gain access to underground water supplies and the use of small diameter multi-stage pumps for lifting this water to the surface is an accepted practice. Design criteria include high efficiency, erosion resistance to sand and silt, constant flow characteristics, minimum maintenance and adjustment, and the ability of pump speeds to suit pole speeds of standard elec-tric motors. Axial flow pumps are discussed in detail and compared with centrifugal pumps. (So African Water Info Center) W77-11550

VISCOSITY EFFECTS OF SLUDGE. For primary bibliographic entry see Field 5E. W77-11722

WATER TREATMENT PLANT DESIGN IS COST-EFFECTIVE,

Engineering-Science, Inc., Arcadia, Calif. For primary bibliographic entry see Field 5D. W77-11742

WAVE AND TIDE ACTUATED HYDRAULIC ELECTRICAL GENERATING APPARATUS,

C. S. Long, and J. Long. U.S. Patent No 4,009,395, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1343, February 22, 1977.

Descriptors: *Patents, *Waves(Water), Tides, *Tidal powerplants, Tidal energy, Electrical powerplants, Floating, Equipment.

A wave and tide actuated hydraulic electrical generating apparatus includes a flotation chamber supported in a water containing basin area connected to a fluctuating water source, such as the tide and wave level of an ocean. The flotation tide and wave level of an ocean. The Hotation chamber rises and falls with the changes in eleva-tion of the water in the basin. The chamber is linked by lever arms through suitable gear mechanisms to a multitude of piston rods as-sociated with a like number of hydraulic cylinders which are connected in hydraulic parallel relation-ship. The movement of the flotation chamber in an ard direction effects movement of the piston upward direction effects movement of the piston rods in a direction relative to the cylinders, and the movement of the flotation chamber in a downward direction effects movement of the piston rods in the opposite direction in their associated cylinders. This movement effects a pumping of hydraulic fluid to a hydraulic turbine to power it. The turbine in turn is connected to an electric generator. (Siebe ORIS) (Sinha-OEIS) W77-11933

WAVE OPERATED POWER PLANT, H. A. Mattera, P. F. Pitts, and M. M. Pitts. U.S. Patent No 4,009,396, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 955, no 4, p 1345, February 22, 1977.

Descriptors: *Patents, *Waves(Water), Ocean waves, Hydraulic systems, Turbine blades, Electric power, Hydroelectric power.

A wave operated power plant is provided where a buoyant vessel is anchored on the ocean surface with wave motion causing displacement of water carried in a chamber in the hull so that upon rocking motion the water is forced upward through pipes on one side of the vessel. The water contacts turbine blades which through shafts rotate electrical generators and generate electricity. The water is returned to the chamber when the vessel moves in the opposite direction and the cycle is repeated with water forced up through pipes in the other side of the vessel, used for electrical generation and then returned to the chamber. The water being forced up from the chamber can contact the blade directly or be stored in a tank on top of the vessel and released at a predetermined rate. (Sinha-OEIS) W77-11934

8E. Rock Mechanics and Geology

SCIENTIFIC INFORMATION IN THE DECI-SION TO DAM GLEN CANYON, California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-261 678, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-177, May 1975. 26 p, 80 ref.

Descriptors: "Streamflow, "Water quality, "Colorado River, "Evaporation, "Sedimentation, "Risks, Dam design, Dam foundations, Hydrology, Rock mechanics, Foundation failure, Utah. Identifiers: "Glen Canyon Dam, "Navajo sandstone, "Lake Powell(Utah).

Scientific issues considered during the debate Scientific issues considered during the debate preceding authorization of Glen Canyon Dam included: (1) streamflow—uncertainties in the future flow of the Colorado; (2) geological foundation of the dam site—weakness of the Navajo sandstone, particularly when exposed to water, would require the design of a dam with low bearing pressure on the rock abutments; (3) suitability of Chinle shale to contain a reservoir, due to its propensity for slumning: (4) exporation—large reservoirs. slumping; (4) evaporation—large reservoirs, needed to store water in the desert, would evaporate more water with greater surface area;

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(5) sedimentation-reservoirs would fill with silt possibly at rates significantly rapid compared with their anticipated economic lifetimes; and (6) water quality-developments in the Upper Colorado Basin could worsen water quality downstream. In addition, one physical science issue raised during the 1950's was that of bank storage. It was debated whether very large amounts of water might leave the Glen Canyon reservoir and enter the banks due to the high porosity of the Navajo sandstone walls. (Singh-ISWS) W77-11583

8F. Concrete

CONCRETE PROPERTIES AT OCEAN

DEPTHS, Civil Engineering Lab. (Navy), Port Hueneme,

Calif. Ocean Structures Div.
H. H. Haynes, and R. S. Highberg.
Journal of the Waterways, Harbors, and Coastal
Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No.
WW4, p 455-470, November 1976. 12 fig, 3 tab, 19

Descriptors: *Underwater, *Construction, *Absorption, *Permeability, *Co strength, Oceans, Pore water, Pressure. *Compressive Identifiers: *High strength concrete, *Offshore structures, *Ocean engineering, Concrete properties, Triaxial tests, Research.

Reported herein are the results of three studies on water absorption and compressive strength of 6-in. x 12-in. (152-mm x 305-mm) concrete control cylinders subjected to simulated ocean conditions, and on the long-term permeability of concrete spheres in the ocean at depths to 4,200 ft (1,280 m). The first study determined that seawater absorption of field-dry concrete was 2.36% by weight after exposure to a pressure head of 550 ft. (168m) for 84 days. The second study determined that the uniaxial compressive strength of concrete saturated and tested under a pressure head of 20,000 ft (6,100 m) decreased by 10% when compared with the compressive strength of fog-cured concrete. Concrete under 1 ft and 500 ft (0.3 m and 152 m) pressure heads had a compressive strength similar to that of fog-cured concrete. The third study re-ports interim data from an ongoing 10-year investigation of the permeability of concrete spheres placed in the ocean. (Bell-Cornell) W77-11779

8G. Materials

PLASTIC PIPES IN SEWERAGE AND DRAINAGE, K. R. Hart.

Plastics Southern Africa, Vol 4, No 5, p 34-55, February 1975, 1 tab.

Descriptors: *Plastic pipes, Pipelines, Plumbing, Design criteria, Pipe dimensions, Conduits, Water conveyance, Domestic plumbing, Water pressure, Design standards, Drainage, Standard specifica-tions, Corrosion, Pressure pipes, Waste water

Four different plastics are in current use throughout the world for sewerage and drainage systems. viz. high-density polyethylene (HDPE), polypropylene (PP), acrylonitrille-butadiene-styrene (ABS) and uplasticized polyvinyl chloride (UPVC). SABS specifications have been drawn up for UPVC pipes for soil and vent, waste, sewer, pressure and drainage piping, choosing pipe dimensions wherever possible from the table for pressure pipes. Colour codes for different applica-tions are:-white for sewers, grey for waste, blue for potable water, green for agricultural purposes and black for electrical conduit. Today more than 50% of new soil, vent and waste pipe installations

are done with the UPVC pipes. The design of pipes and fittings and methods of jointing are discussed in detail. UPVC sewer pipes are compared with the ideal standards, covering cost per unit, strength, inertness, impact and abrasion resistance, weight, friction coefficient, availability, sistance, weight, friction coefficient, availability, leak-proof joints, and trouble-free use. New developments in the plastic pipe field include helically wound pipes with reinforced plastic or steel ribs built into the helix, thin-walled concentric pipes with the intervening space filled with concrete, and pipes made from glass-reinforced polyester resin mixed with sand. (So African Water Info Center)

ROOF DRAINAGE OF LARGE BUILDINGS IN

SOUTH AFRICA, University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering. For primary bibliographic entry see Field 3B. W77-11555

BALL CLEANING OF SEWER PIPES,

National Building Research Inst., Pretoria (South

. C. Miles, and A. M. Murdoch. Municipal Engineer, Vol. 7, No. 3, p 89-93, 1976. 5 fig, 2 tab.

Descriptors: *Sewers, *Pipelines, Maintenance, *Cleaning, Equipment, Hydrostatic pressure, Hydraulic head. Identifiers: South Africa.

Cleaning tests have been carried out by the National Building Research Institute, using sewer cleaning balls imported from the USA and the results have confirmed the claims made by American sewer authorities about the efficiency and economy of this cleaning method. In sewer ball cleaning, the ball, which is made of tough rubber and is inflatable, is placed in the sewer to be cleaned. This restricts the sewer flow and a hydraulic pressure builds up behind the ball, propelling it along the line. Debris in the line is moved along ahead of the ball while water escaping past the ball has a scouring effect on the pipe. The passage of the ball along the sewer is controlled by a cable attached to a lug on its upstream face. The tests show that this cleaning method is effective and inexpensive. It is especially suitable or maintenance cleaning programmes and for testing the integrity of sewers, because of the speed at which the ball can pass through a pipeline. (So African Water Info Center) W77-11566

BIBLIOGRAPHY ON DISCHARGE MEASURE-MENT TECHNIQUES,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 10C. W77-11594

ADEQUACY OF DREDGING METHODS AND EQUIPMENT IN THE UNITED STATES FOR MAINTENANCE OF NAVIGABLE WATERS, American Society of Civil Engineers, New York. Committee on Waterways of the Waterway, Port,

Coastal and Ocean Div.

W. L. Black, D. R. Basco, T. D. Burke, A. P.

W. L. Black, D. K. Basco, I. D. Burke, A. P. Crouse, and A. W. Mohr. Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW3, Proceedings Paper 13146, p 349-372, August 1977. 1 fig, 10 tab, 9 ref, 1 append.

Descriptors: *Dredging, *Spoil banks, *Navigable waters, *United States, Canals, Channels, Construction equipment, Harbors, Transportation, Earth handling equipment, Excavation, Materials, Slurries, Equipment.

Identifiers: *Dredges, *Excavating equipment, Dredging Hast

Identifiers: *I Dredging fleet.

The Task Committee reviewed the dredging fleet of the United States (both Federally and privately owned) to determine the fleet's usage rate and adequacy. Basic information and needs, such as type of material disposal, new dredging parameters, and environmental concerns, were docu-mented. The dredging fleet was not able to meet the above mentioned needs or to fill the current need for operations in exposed waters and for beach nourishment. Generally, there were insuffi-cient hopper and sidecasting dredges (entirely Government owned). The dustpan and mechanical dredge fleet was adequate to cope with existing and foreseeable requirements. Pipeline dredges were only about 50% in capacity (predominantly privately owned) and were in need of modernization. (Roberts-ISWS)

8I. Fisheries Engineering

COMPOSITE SAMPLING METHOD AND SYSTEM, Department of the Interior, Washington, D.C.

For primary bibliographic entry see Field 5A. W77-11920

SOLID-STATE ENVIRONMENTAL CONTROLLER FOR AQUACULTURE SYSTEMS

Oceanic Inst., Waimanolo, Hawaii. S. Ribakoff, and C. Pelton.

The Progressive Fish Culturist, Vol. 39, No. 3, p 109-111, 1977. 3 fig, 4 ref.

Descriptors: *Aquiculture, *Fish management, *Equipment, *Control systems, *Design, *Research and development, Environmental control, Aquaria, Monitoring, Regulation, Salinity, Photoperiodism, Fish farming, Fish food organisms, Fish handling facilities, Mullets, Larvae, Phytoplankton.

Identifiers: Solid-state environmental controller, *Striped Mullet, Mugil cephalus.

The development and operation of a solid-state environmental controller that was designed to be used in conjunction with facilities for rearing larval striped mullet (Mugil cephalus), was described. The unit monitored and automatically regulated photoperiod, salinity, and phytoplankton population. (Klein)

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

1975-1976, ANNUAL REPORT, WARESOURCES RESEARCH INSTITUTE OF WATER UNIVERSITY OF NORTH CAROLINA. North Carolina Water Resources Research Inst. Raleigh.

For primary bibliographic entry see Field 9D. W77-11794

9D. Grants, Contracts, and **Research Act Allotments**

1975-1976, ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA. North Carolina Water Resources Research Inst.,

National Technical Informa-tion Service, Springfield, VA 22161 as PB-272 322, Price codes: A04 in paper copy, A01 in microfiche. Report UNC-WRRI-76-00, (1976), 58 p. OWRT A-999-NC(50), 14-34-0001-6034.

Descriptors: *Water Resources Institute, Educa-tion, *Universities, *Colleges, *North Carolina, Training, *Projects, *Research and development.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N. C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 29 member Advisory. Compittee representative of State and visory Committee representative of State and Federal water agencies, industry, conservation, agriculture, local government, and the general agnitudes, or a grown guidance and review. The Institute's research program for FY 1975-76 was supported by an annual allotment and 17 matching grants from OWRT, USDI; a grant from EPA; matching State appropriations; and grants from the Division of Environmental Management, N. C. Department of Natural and Economic Resources. One research project was jointly supported by the Institute and the University of North Carolina Sea Institute and the University of North Carolina Sea Grant Program. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1975-76, projects were conducted at N. C. State University, Univer-sity of North Carolina at Chapel Hill, Duke University, East Carolina University, and Univer-sity of North Carolina at Charlotte.

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication **And Distribution**

FINAL REPORT OF THE TASK COMMITTEE

ON BRANCHING CONDUTTS,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 8B.

BIBLIOGRAPHY ON DISCHARGE MEASURE-MENT TECHNIQUES.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. E. B. Pickett, S. Vigander, J. C. Schuster, and L. J.

Hooper.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY8, Proceedings Paper 13141, p 889-903, August 1977.

Descriptors: *Bibliographies, *Discharge measurement, *Discharge(Water), Reviews, Flow, Flow measurement, Measurement, Methodology, Publications, Information exchange, Information retrieval, Data collections, Instrumentation, Current maters, Velocity, Research and development rent meters, Velocity, Research and development.

The Task Committee's change relative to flow The Task Committee's change relative to flow measurement included a review of techniques available, the encouragement of research in flow measurement, and the preparation of a final report. Two older published bibliographies concerning flow measurement are well known and generally available. The first, by Kolupaila covers the science and art of flow measurement from its historical beginnings to approximately 1960. The historical beginnings to approximately 1960. The second, by Dowden, begins with the year 1950 and covers contributions to 1970. In 1970 during the tenure of the Task Committee, a symposium on hydrometry was held at Koblenz, Germany, under nyurometry was ned at Koolenz, Jeermany, under the auspices of the International Association of Hydrological Sciences. A 1975 paper published in the Transactions of the American Society of Mechanical Engineers also was referenced as a worthwhile evaluation of measurement methods. This bibliography will provide a ready reference This bibliography will provide a ready reference for those engaged in utilizing and developing methods of hydrometry. (Froehlich-ISWS) W77-11594

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LAGOONS AND OXIDATION PON (LITERATURE REVIEW), Black and Veatch, Dallas, Tex. For primary bibliographic entry see Field 05D. W77-11714 PONDS,

MICROBIOLOGY OF WASTE TREATMENT, (LITERATURE REVIEW), Pennsylvania State Univ., University Park. For primary bibliographic entry see Field 05D. W77-11729

DISINFECTION, (LITERATURE REVIEW), Georgia Inst. of Tech. Atlanta. For primary bibliographic entry see Field 05D. W77-11730

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS, Arizona Univ., Tucson. Office of Arid Lands Studies. For primar W77-11787 ry bibliographic entry see Field 06E.

SOCIAL, ECONOMIC, AND ENVIRONMEN-TAL IMPACTS OF COAL GASIFICATION AND LIQUEFACTION PLANTS, AME Technology, Inc., Lexington, Ky. For primary bibliographic entry see Field 06G. W77-11851

10F. Preparation Of Reviews

THE WINTERS DOCTRINE: SEVENTY YEARS OF APPLICATION OF 'RESERVED' WATER RIGHTS TO INDIAN RESERVATIONS, Arizona Univ., Tucson. Office of Arid Lands Studies. For primary bibliographic entry see Field 06E. W77-11787

MODELING THE IMPACT OF STRIP MINING AND RECLAMATION PROCESSES ON QUALI-TY AND QUANTITY OF WATER IN MINED AREAS: A REVIEW,

Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center. For primary bibliographic entry see Field 05C. W77-11833

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Office of Water Research and Technology	W77-11787, 11941	2
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- · Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- · Water resources economics at the Water Resources Center of the University of Wisconsin.
- · Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- · Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- · Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
- WATER RESOURCES PLANNING
- **RESOURCES DATA**
- **ENGINEERING WORKS**
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